Vol. 196 83rd Year No. 3572

THE GAS JOURNAL

NOVEMBER 4, 1931

Autumn Research Meeting of the Institution

Next week's issue of the "JOURNAL" will contain a full report of the discussions, together with a review of the proceedings, at the 3rd Autumn Research Meeting of the Institution of Gas Engineers

Our National Organizations.

In our Correspondence columns to-day Mr. J. R. Bradshaw replies to the editorial remarks regarding his recent address before the North of England Gas Managers' Association and to the letters of Mr. C. F. Botley and Mr. W. Clark Jackson. [p. 302.]

New Gasholder at Lincoln.

On Oct. 26, the Lincoln Corporation placed in service a 1¼ million holder erected by Newton Chambers & Co., Ltd. The holder is of the spiral-guided type, with mild-steel tank. The soil excavated for the tank was 8896 tons, and the material used in the reinforced concrete foundations included 150 tons of cement, 310 tons of sand, 593 tons of gravel, and 18 tons of steelwork. [p. 308.]

"Buy British" Campaign.

On Monday, Nov. 16, the Empire Marketing Board is launching throughout England, Scotland, Wales, and Northern Ireland an intensive campaign in favour of "Buying British" from the Empire at Home and Overseas. Every retail trader in the United Kingdom is asked by the Board to assist in a practical way to make this bid for the furtherance of British trade and employment an outstanding success. [p. 305.]

Gas as a Fuel.

The calorific value of a gas is not the sole criterion of the value of the gas; and other factors such as maximum flame temperature, ignition velocity, and speed of flame propagation have to be taken into account. The policy of the German Association of Gas and Water Engineers in recommending that town gas should consist of a mixture of coal gas and water gas of a calorific value between 470 and 480 B.Th.U./c.ft. is endorsed by K. Bunte. [p. 308.]

Annual Meeting of Yorkshire Junior Association.

The 28th Annual Meeting of the Yorkshire Junior Gas Association took place on Oct. 24, at the Fuel Department of Leeds University. Mr. J. W. Horwill (Bradford), retiring President, occupied the chair, and there was a large attendance. The business meeting being over, Mr. H. Singleton, Engineer and Manager to the Huddersfield Corporation Gas Department, gave an address, in which he dealt, among other things, with the subject of education for young gas engineers. [p. 315.]

Gas at Birmingham Building Exhibition.

The Birmingham Building Trades Exhibition naturally makes its appeal primarily to the architects and builders, but there is always a good attendance of prospective house purchasers. The stand of the Gas Department was therefore erected and equipped with a view to interesting these particular sections of the Department's customers. All the domestic uses of gas were exemplified by specimen appliances correctly fitted. [p. 310.]

Oxide of Iron Purification.

Much has been published recently on the various wet purification systems, claiming their advantages over the old oxide purification method, but to be just to the old servant it is necessary to put forward a claim for the results which can be obtained in a well-designed plant using a suitable oxide of iron mixture. This Messrs. R. H. Clayton, H. E. Williams, and H. B. Avery proceed to do in a paper on the subject presented to the Manchester District Institution of Gas Engineers. [p. 311.]

A Review of the A.G.A. Convention.

A special correspondent in to-day's issue reviews the 13th Annual Convention of the American Gas Association, held in Atlantic City from Oct. 12 to 16, the opening session of which was marked with the usual flavour of internationalism, as evidenced by the telegrams of good wishes from British and European Gas Associations, the election to honorary membership of the Presidents of those societies, and the presence on the platform of Sir Francis Goodenough, C.B.E., and Mr. J. Herbert Canning, O.B.E. [p. 309.]

Low-Temperature Carbonization.

Mr. J. H. Brearley asks Col. Bristow to supply information on the actual tonnage of coal treated at the low-temperature carbonization works in which he is interested, up to the last financial make-up, and the period of operation which this covers; the quantity of oil produced as petrol and its cash yield per ton of coal carbonized; the tonnage of smokeless fuel produced, yield per ton, and cash yield per ton of coal carbonized; the cost of coal (average) per ton; and other costs of production, including wages. [p. 302.]

EDITORIAL NOTES

The Turning Point

IT has been a long lane, but the turning point is reached at last, and it is now possible to look forward to an improved condition of things both generally and individually. Already one senses that the atmosphere is different. The optimists feel that they have been justified, and that others had taken a too serious view of things—overlooking, perhaps, the fact that it was the driving home in the minds of the electorate of the seriousness of the position which brought about a result astonishing in its magnitude. The position was difficult, the explanations necessary were hard to make to those unused to "currency," "trade balances," and other complicated questions involved, and the time at disposal for this enlightenment was short. But the work was done, and done thoroughly. Thanks are due to those who, at this critical juncture, and sometimes, as we have seen, at personal sacrifice, have placed the welfare of the country before any other consideration. A wondrous page has been added to British history. The call was imperative; it was answered, as it always has been answered, and as we believe it always will be answered. The world has received evidence incapable of being misconstrued that the British nation is as sound as ever it was.

To this evidence all have contributed. Though we decline to regard this election as a Party one—we would wish the printer could put "party" with the very smallest possible "p"—there was, of course, an opposition, and this opposition, by giving such unmistakable proof of what the country would have been "in for" had they been successful, must have contributed largely to their own undoing. While there was undoubted difficulty in putting simply before the people what should be done and why, the opposition themselves left no reasonable doubt as to what should not be done, and have been effectually deprived of the opportunity of doing it. And now, if purely Party considerations are allowed to remain in the background, we may confidently look forward to some years of sane finance, with all the benefits which it must bring in its train. During the week-end it was stated that the Prime Minister had gone off quietly to study the problem presented by "the difficult and delicate task of picking his Cabinet from a host of claimants to office." If all these claimants base their demands for office, as should be the case, upon their superior ability to be of service to the country in this its hour of need, the new Cabinet should be powerful for good.

It may be a coincidence, but it certainly is a fact, that following upon the formation of a National Government there has, for several weeks in succession, been a decrease in the unemployment figures. The gain is not a very large one, but it has occurred at a time of year when the tendency is usually of the opposite kind. If the tide has already begun to flow in the right direction, the task that lies ahead will be the easier of accomplishment.

A Big Figure Election

THE election has been a staggering one in several respects. Although as the campaign proceeded confidence in the result steadily grew, the actual figures came as an overwhelming surprise even in the most pro-National Government quarters. After the appeal to the country, Mr. Ramsay MacDonald continues his leadership, but with a majority of round-about 500—a majority of unprecedented proportions. In every part of the country the tale was the same. Socialist seats reputed "safe" went by the score, and Parliament meets with but a remnant to represent the opposition. While the Socialists, too, were going down like nine-pins, National Government candidates were being returned by unheard of majorities. A hundred and more successful candidates were more than 20,000 votes ahead of their opponents, while at Brighton the two members had each a majority of over 62,000.

Following upon his own defeat, Mr. Arthur Henderson, who led the opposition on the formation of the National Government, declared that "a shattering blow has been dealt at Labour in Parliament." This is surely not the case. The extremist section has certainly suffered an eclipse, but the main body of Labour must obviously be well represented by the newly elected members. The numbers of votes cast, and the bewildering frequency with which huge majorities were turned into equally emphatic minorities, showed this to be so. The last thing which the defeated candidates are likely to blame for the fate which has overtaken them is their own policy; but it should be the first. One can imagine easily some of the things that will be said, but no argument can demolish the share of the credit that is due to Labour for the sweeping victory of the National Party, and nothing can destroy the proof of patriotism and sound common sense on the part of the electorate in general which the polls have provided.

Parliament contains many fresh faces. Gone with Mr. Henderson are Mr. Herbert Morrison, of electricity boosting fame, Mr. J. R. Clynes, Mr. A. Greenwood, and Miss Margaret Bondfield, together with almost every other Socialist ex-Minister. Mr. Arthur Hayday, who represented West Nottingham in the Labour interest, has been defeated; but Mr. Will Thorne, who has been the Labour member for West Ham (Plaistow) since 1906, was returned unopposed. Mr. Thomas has been denied his pension by his Union, but the voters of his constituency at Derby have shown themselves to be possessed of broader minds and more reasoned judgment by putting him in with a greatly increased majority.

It is especially gratifying to note that the Gas Industry will once again have the benefit of Mr. Reginald G. Clarry's presence in the House of Commons. Mr. Clarry represented the Borough of Newport from 1922 until 1929, when he lost the seat to Labour; he has now recaptured it, by a majority of 8591. In addition to being Chairman of the British Road Tar Association, and of the International Road Tar Conference, Mr. Clarry is a Vice-President of the Gas Companies' Protection Association. Possibly as soon as the Government have performed their most pressing financial tasks Mr. Clarry may be able to do something in the way of speeding up that new legislation for which the Gas Industry is so patiently—or should it be written "impatiently?"—waiting.

Views from Yorkshire

THE Yorkshire Junior Gas Association commences its session's work each year in a singularly happy manner. The custom is to meet at Leeds University, and listen to an address given by a Senior member of the gas profession; and one has only to turn to the files of the "JOURNAL" to appreciate how helpful these addresses must prove to the Association. Mr. Singleton's address a fortnight ago is no exception in this respect; it is bright, concise, and constructive. He confines his attention to three practical matters—education, coke sales, and gasholder maintenance—and regarding each he offers useful suggestions, of which sight ought not to be lost. On the question of education he points to the fact that a great deal of the study necessary for gaining by examination admission to membership of the Institution of Gas Engineers is on similar lines to that which must be followed by aspirants to membership of the Institu-

tion of Civil Engineers. It is not, of course, that Mr. Singleton in any way depreciates the worth of membership of the Institution of Gas Engineers; he simply indicates that a little extra work during the time when the student's brain is well packed with examination data, and his mind in the best frame for quick assimilation of and retention of detail, would enable him to gain the Hall Mark of the engineer. And the extra study entailed is certainly applicable to the work of the gas engineer.

Turning to the sales of coke, Mr. Singleton emphasizes what a change would take place in the coke market if our Industry could persuade each gas consumer to burn only 2 cwt. more coke a year. That this ought not to be dismissed as an impossibility is evident from the results which have attended the efforts of those undertakings—Halifax, to mention one instance—who have faith in the solid smokeless fuel they produce, and send it on to a cultivated market in a really saleable condition. In general, we are not employing enough modern salesmanship in regard to coke. As Mr. Singleton says: "In selling gas and gas appliances we have showrooms to demonstrate the appliances, and salesmen and canvassers to push the goods and secure orders and satisfy consumers, and even to offer maintenance services. What do we do with coke customers?—just take their orders, send them the coke, and then send the account?" This can hardly be termed modern business; and we think that all gas undertakings making (say) 150 million c.ft. a year and over should seriously consider employing a coke salesman—not merely a person calling for orders, but one qualified to discuss fuels, efficiencies of use, and practical application to obtain the best results. In other words, a solid fuel technician and salesman.

As to the question of gasholder maintenance, Mr. Singleton has had ample opportunity of gaining first-hand experience. In addition to erecting two new holders, during the last three years he has had three holders resheeted, and has been able to gather interesting data regarding the condition of old holders. Particulars which he sets out relating to a wrought-iron holder which has been in use for 66 years demonstrate what a long, useful life holders can have with ordinary care and regular attention. The point which Mr. Singleton makes is that no annual inspection provides so much information or is as valuable as that which is accumulated by constant attention and observation by those who are responsible for its good working.

Oxide Purification

Much has been written lately about this subject, which is a good sign that more consideration is being paid to a process, seemingly simple but in fact highly complicated, which has an important bearing on the economics of gas manufacture. The latest contribution is a composite one by Messrs. R. H. Clayton, H. E. Williams, and H. B. Avery. It is really better defined as a comprehensive treatise than a paper, and with the space at our disposal we cannot do other than publish an abstract of some nine thousand words—which, however, is rather a lot. The paper was presented at the last meeting of the Manchester District Institution of Gas Engineers, and the authors are peculiarly well fitted to deal with the problem of oxide purification.

The authors set out 35 chemical equations representing reactions which can occur during the purification process, and the point they make is that, though many of the reactions are of comparatively minor importance under normal working conditions, they may assume great significance under unusual conditions. So, from the basis of the final product—spent oxide—the problems of oxide purification are first examined, and emphasis is laid on the economy of increasing the sulphur content of spent oxide above 50 p.ct. "The common practice in this country is to obtain a 50 p.ct. sulphur spent oxide in two or more exposures with a time contact ratio of 25 to 30, and it is our opinion that if the quantity of oxide exposed to the gas were increased to make this ratio 12 to 15, in most of these stations 55 p.ct. to 60 p.ct. spent oxide could easily be obtained, with the probability of reducing the oxygen content of the purified gas." The effects of moisture, ammonia, physical condition of the oxide mass, and tar are fully considered, and, in regard to the last-named, an interesting and simple apparatus is described for ridding the gas of suspended tar particles.

Much valuable information is given on the working of purifier boxes, and we call particular attention to the authors' observations on catch boxes. They are strongly in favour of the system of working the catch box or boxes in turn with the main set—that is, not to use catch boxes as such, but to have a working set of five or six boxes all of which have equal work to perform, preventing any one box becoming unduly moist or inactive. They also stress the advantages of divided gas flow with reversing valves. The concluding part of the contribution is concerned with a comparison between English and Continental practice, and the suggestion is made that existing 6-ft. English boxes should be deepened to enable them to contain up to twice the volume of oxide per unit of ground space.

Importance of Public Lighting

Every user of the highway must feel that his chances of long life are influenced in a daily increasing degree by the quality of the public lighting in the areas through which he passes, and it must be realized therefore that the responsibility of a Public Lighting Superintendent is an ever-growing one. To carry out with the maximum of efficiency duties upon which so much depends, such an official must, of course, be fully qualified, and it should be in the interest of all concerned for him to occupy an independent position, as is already the case in some places. The Association of Public Lighting Engineers have done much to raise the status of the profession, and it is, we believe, the view of the Council of that Association that in every city of importance the public lighting should be handled by a qualified engineer in an independent position, specially assigned to this duty, and not subordinate to other departments which may know little about street lighting. The matter has, we notice, been raised in the pages of "The Illuminating Engineer," in connection with the invitation (which recently appeared in our advertisement pages) of the City of Manchester for applications for the position of Public Lighting Superintendent.

Forthcoming Engagements.

Nov. 7.—London and Southern District Junior Association.—Visit to Southall Works of the Gas Light and Coke Company.

Nov. 7.—Scottish Junior Association.—Joint Meeting in the Royal Technical College, Glasgow. Address by Mr. F. P. Tarratt, Vice-President of the Institution of Gas Engineers.

Nov. 10.—Institution of Gas Engineers.—Finance Sub-Committee, 10 a.m.; Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Tar Sub-Committee, 12.15 p.m.; Education Executive Committee, 4 p.m.; 28, Grosvenor Gardens, S.W. 1.

Nov. 11.—Manchester District Association.—Joint Meeting with North-Western Section of the Institute of Fuel, at Engineers' Club, Manchester. Paper by Dr. C. M. Walter.

Nov. 12.—Midland Association.—Autumn Meeting in Birmingham.

Nov. 13.—Gas Companies' Protection Association.—Annual Meeting. Caxton Hall, at 2.30. Meeting of the Committee following the General Meeting.

Nov. 17.—Institution of Gas Engineers.—Institution Session at the 6th Public Works, Roads, and Transport Congress and Exhibition, 1931, 11 a.m.

Nov. 18.—B.C.G.A.—Meetings of Executive and General Committees at 11.30 a.m. and 2.30 p.m. respectively.

Nov. 19.—S.B.G.I.—Council Meeting and Autumn Meeting at the Hotel Metropole.

Nov. 19.—B.C.G.A.—District Conference at Swansea.

Nov. 20.—Institution of Gas Engineers.—Liquor Effluents and Ammonia Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Nov. 24.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting.

CORRESPONDENCE

Our National Organizations

SIR,—As the reference to the above in my recent address to the North of England Gas Managers' Association has been commented upon by yourselves and two of my colleagues, it seems incumbent upon me to offer some sort of answer to your and their criticisms; and let me say at once that an ensuing public correspondence was the farthest thing from my mind at the time I framed my very innocent, and as I thought in my simplicity, helpful remarks.

In the first place, Sir, I cannot follow your editorial remarks of the 14th of October, when you suggest that a co-ordinating committee would tend to destroy a unity which exists at the present time. I am unable to find any justification for such a statement.

My case for co-ordination and unification of our National bodies should be clear, to my way of thinking, when we ask ourselves whether we (or our undertakings) shall be members of the Institution of Gas Engineers, the National Gas Council, the Federation of Gas Employers, the B.C.G.A., the Road Tar Association, the Sulphate of Ammonia Federation, the appropriate District Associations and their Commercial Sections, to name some of the more important bodies. We find only one answer, an unqualified affirmative, everyone of them. We are failing in our duty to ourselves, our undertakings, and the industry generally, if we do otherwise. We cannot be engineers, we cannot be managers, we cannot be secretaries, unless we keep *au fait* with their doings, *all* of them, not one any more than another.

Mr. Botley very properly states that "so many problems come before the Industry to-day which cannot be dealt with in watertight compartments." Exactly; neither can we run our undertakings in watertight compartments. We have to be alive to *all* the problems which arise every day and all the time, and we do not sit in one room to consider one problem, and in another room for another problem. Our daily problems are composite and complementary. There are very few of them which do not re-act one against another, and they all go to make up our daily job. Why, therefore, when all these things, which crop up in all their different and varying phases every day in our own work and offices, are considered generally and nationally, must we try to put them into watertight compartments?

As a practising gas engineer, I cannot detach myself from such work as, for example, the B.C.G.A. is performing, and must continue to perform, nor from all the organizations I have referred to. The only organizations which I need to consider separately from the above, in my mind, are the National Gas Council and the Federation of Gas Employers, whose work is very special and need not overlap any of the others; and these could possibly be combined without hurting anybody, or losing anything in efficiency.

The correspondence, however, shows once more the inherent futility of trying to settle contentious matters by correspondence. We all have our different ideas, and nothing gets done; it is not to be expected. Therefore, I say, appoint a committee to find out whether our time can be saved or not. If it cannot, I am perfectly satisfied and happy. If some terrible calamity is likely to overwhelm the Industry by making any change, surely the committee will find it out and warn us in time. As to terms of reference, let them be the widest possible, the object being to explore any and every means of co-operation, defining of limits, and merging of our national bodies or any other thing which will tend to deal with matters of common interest with efficiency and despatch and which will ensure that one problem is dealt with by one and only one organization.

Your remedy for too much work—let someone else do it—sounds very simple, but I submit with the greatest respect that it expresses a spirit which is not, and I hope never will be, really popular in this country.

You state that "no one can possibly confuse the Institution of Gas Engineers and the B.C.G.A. for example." Perhaps not; but (again for example) while I am thoroughly delighted to inspect London's wonderful street and flood lighting to-night as a member of the Institution, I certainly do not wish to do it all again to-morrow night as a member of the B.C.G.A.

It is a pity it has been felt necessary to point out to me the necessity, I call it essentiality, of the various national and district bodies. No one has a greater admiration of them than I, and I think few gas engineers make more use of them, but of course that is not my point at all.

Again, if my friend Mr. Clark Jackson can find any sarcasm in my reference to our associations, I am afraid he or I must buy a new dictionary!

Finally, I wish to assure you and those who read my address that my remarks were made with the best intentions. I only want what is best for the Industry, and in particular to ensure that no individual undertaking shall suffer through too severe national demands on its officers' time for my benefit.

J. R. BRADSHAW.

West Hartlepool,
Nov. 2, 1931.

"Future Possibilities of Fuel Utilization"

SIR,—Referring to Col. Bristow's letter on this subject in your issue of Oct. 21, it would be helpful if he can give the following information:

(*a*) The actual tonnage of coal treated at the low-temperature carbonization works in which he is interested, up to the last financial make-up, and the period of operation which this covers.
(*b*) The quantity of oil produced as petrol and its cash yield per ton of coal carbonized.
(*c*) The tonnage of smokeless fuel produced, yield per ton, and cash yield per ton of coal carbonized.
(*d*) The cost of coal (average) per ton.
(*e*) Other costs of production, including wages.

Actual balance-sheet figures are desirable as being the best indication of how near commercial success the process is.

Col. Bristow must agree that such observations as "several large commercial plants have been built and put into operation," "The output of smokeless fuel in England has steadily increased . . . and there are now 2000 distributors of low-temperature smokeless fuel," "Smokeless fuel is widely popular," &c., should be supported by some dimensional evidence in terms of the products actually supplied. We know from official returns that the high-temperature carbonizing industries produced (and sold) smokeless fuel in 1930 as follows: Ovens, 11,514,021 tons; gas-works, 7,869,419 tons. Deducting from these figures the amount of coke exported and used in blast furnaces, we still had left for home disposal from the two industries over 10 million tons. From the aspect of testing the real progress being made by low-temperature carbonization, it is desirable we should have corresponding figures relating to same—at present denied by returns issued officially.

We hardly expect low-temperature production of coke to run into millions of tons per annum; nevertheless, it would be interesting and instructive if we could have the actual figures, and no one is better placed for affording this information than Col. Bristow.

J. H. BREARLEY.

Wharmton,
Harrogate,
Oct. 30, 1931.

Benzole v. Trams

SIR,—With reference to your Editorial on p. 242 of the "JOURNAL" for Oct. 28, there is one aspect of benzole extraction, which will give an immediate economy, which may not be as fully realized as it deserves.

Electric trams are now generally considered obsolete. Petrol buses are superseding trams, being:

(1) More commercially economical.
(2) More speedy.
(3) More flexible in use.
(4) Do not obstruct the road to other motor traffic.
(5) Safer, inasmuch as passengers are picked up and set down at the pathway (not in the roadway as with trams).

In one Corporation at least the gas-works extract the benzole, which benzole is used to run the Corporation buses. Accordingly, the Corporation trams are shut down. As the trams hitherto bought the electric current from an Electric Generating Company, in competition with the Corporation Gas-Works, the remarkable business effect of the change-over will be obvious.

"ADREM."

Oct. 30, 1931.

Hydrogenation

SIR,—Dr. Ormandy might have done me the honour to read my contribution to the discussion on his paper on "Coal, &c.," before attempting to rend me. I pointed out that the recent study of the physical chemistry of hydrogenation processes indicated that they were of a much more complex character than was suggested in his paper. In dealing with such processes it is generally considered advantageous to simplify them, which could be done in the case of the hydrogenation of coal by studying the hydrogenation of the constituents of coal, rather than the hydrogenation of raw coal. It is hardly a reply to my criticism of his statement of the case to tell me that he knows one hundred times more about the subject than I do. The issue remains; and I still regard the method of attack which I advocate as being the scientific method, while the alternative of heating coal and hydrogen under pressure to see what will happen seems to me rather too crude to be classed as research at all.

M. W. TRAVERS.

University of Bristol,
Oct. 31, 1931.

PERSONAL

CHANGES AT IPSWICH.

Mr. Frank Prentice becomes a Director.

There will be great pleasure throughout the Industry at the news that Mr. Frank Prentice's fifty years of service with the Ipswich Gas Light Company has been marked by his election to a seat on the Board, on his retirement from the position of Engineer and Manager, as from the end of the present year. In this way, the Directors are glad to think that, after his long association with the Company and with his great knowledge of its working and of the district it supplies, they will still have the advantage of his services. Older readers may recall that a similar mark of appreciation was accorded Mr. John T. Jolliffe, in 1914, on his retirement from the position of Manager and Secretary, after about 27 years' service with the Company. Mr. Prentice was then appointed Engineer and Manager, having taken charge of almost every department of the Company's business since he entered the service as chemist in 1881. Mr. Prentice, at the Leeds meeting of the Institution of Gas Engineers last year, gave his experiences with a waterless gasholder (the first to be erected in this country); and in 1927 he occupied the Chair of the Eastern Counties Gas Managers' Association. Mr. A. W. SUMNER, Engineer and Manager of the Grays Gas Company, recently amalgamated with the Gas Light and Coke Company, has been appointed to the position vacated by Mr. Prentice.

PRESENTATION TO MR. WM. CASH.

After an existence of nearly 100 years the Worthing Gas Light and Coke Company came to an end, as a separate entity, on June 30 last and the final meeting of the Board of Directors was held on Sept. 12 to receive the statement of the last six months' accounts. It was felt that the occasion could not be allowed to pass without meeting socially, and the Chairman, Mr. WM. CASH, F.C.A., J.P., entertained his co-Directors together with the Secretary and the Engineer and General Manager to dinner at the Hotel Metropole, Brighton, on Friday evening, Sept. 11.

We learn from the "Brighton, Hove, and Worthing Gas Company Co-Partnership Magazine" that a pleasant evening was spent, and the opportunity was taken to present the Chairman with a souvenir of the occasion in the form of a handsome silver salver having the inscription: "Presented to Wm. Cash, Esq., F.C.A., J.P., Chairman of the Worthing Gas Light and Coke Co., 1919-31, by his Co-Directors and Officers at the Final Board Meeting held on the 12th September, 1931." On the centre of the plate were engraved the Autographs of the members of the Board and of the two Chief Officers. In making the presentation, Mr. Denton, the Deputy Chairman, mentioned that Mr. Cash had been Chairman of the Company during the most prosperous period of its career, and that, under his guidance, it had made wonderful progress.

In expressing thanks for what he described as a beautiful gift, Mr. Cash said it was one he would always treasure as a memento of happy times. In the course of further remarks he said that while a feeling of regret was felt by all at the passing of the old Company, he entertained no doubt that Worthing would work whole-heartedly with Brighton in furthering the interests of the Brighton, Hove, and Worthing Gas Company and raising it to even greater prosperity.

Mr. REGINALD G. CLARRY, who has been re-elected for his old seat, Newport (Mon.), with a majority of over 8000, is Chairman of the British Road Tar Association and the International Road Tar Conference. He entered Parliament in 1922 in a by-election. A few hours later the Government collapsed, and in the three General Elections which followed in quick succession Mr. Clarry was again successful, so that he holds what is believed to be a political record—that of having fought and won four parliamentary contests in two years.

Mr. SAMUEL B. LANGLANDS, J.P., who has completed 25 years as Glasgow's lighting inspector, was presented last week by the employees in his Department with three silver bowls. Councillor MacDougall, Chairman of the Watching and Lighting Committee, made the presentation.

Mr. F. C. SYLVESTER, Assistant Gas Engineer and Manager at Hinckley, has been appointed Gas and Water Manager to the Newton-in-Makerfield Urban District Council. He served for some time with the British Cyanides Company, Ltd., and as Assistant to Mr. J. W. Allin at West Bromwich. He was awarded the Institution of Gas Engineers Diploma 1st Class, in 1928, and has been under Mr. F. Lee at Hinckley for the past 2½ years.

From 95 applicants, Mr. WALTER ARMITAGE DEARDEN (36), Gas Engineer at Johnstone, has been unanimously appointed Gas Manager and Engineer to the Lancaster Corporation in succession to Mr. George Dixon. Mr. Dearden is a Halifax man and studied Chemistry and Engineering at Halifax Municipal Technical College, and attended lectures at Leeds University. From 1920-25 he was Lecturer on Gas Engineering at Heriot Watt College, Edinburgh. In 1922-23 he was President of the Scottish Junior Gas Association (Eastern District), and is now the Chairman of the Western District (Commercial Section) of the North British Association of Gas Engineers. From 1912 to 1919 he was a pupil technical assistant at the Halifax Gas-Works under Mr. W. B. McLusky. From 1919 to 1924 he was Assistant Engineer at Dunfermline, and in 1925 was appointed Gas Engineer to the Johnstone Corporation.

Two years ago the Kendal Corporation asked Mr. THOMAS CROWDY, Engineer and Manager of the Gas and Water Department, to re-organize their Undertaking, and to carry through the scheme under his personal supervision. After completion the Corporation placed on record their high appreciation of his services. At a Council meeting held on Oct. 27 they decided to show their gratitude in a more tangible form, and it was agreed without one dissentient to pay Mr. Crowdy £125 for his extraordinary services during the past two years in connection with the extensions and improvements of the plant at the gas-works, and for the gratifying results so far obtained.

OBITUARY

ALD. SIR JOSEPH CALVERT.

The death occurred, after a long illness, of Sir Joseph Calvert, at his home, Park View, Middlesbrough, on Oct. 31. Sir Joseph was 78 years of age.

Ald. Sir Joseph Calvert was four times Mayor of Middlesbrough. As Chairman of the Gas and Electricity Committee he played a conspicuous part in the development of the sister undertakings to the present stage.

No man had done more for Middlesbrough in carrying through successfully negotiations of a delicate character designed to improve the amenities of the town. Sir Joseph was made a freeman of the Borough in 1919. He had been a Justice of the Peace for 25 years.

He was elected a member of the Middlesbrough Town Council for the Grove Hill Ward on Oct. 31, 1902, and up to the time of his becoming an Alderman, in 1919, he had served that ward continuously. In fact, he had not been opposed.

He had been Chairman of the Gas and Electricity Committee since November, 1910. He was eminently fitted for this position, for there were few things Sir Joseph did not know about the coal trade. He was a Director of more than one colliery company, and had been a member of the Northumberland and Durham Colliery Owners' Association. Some of his efforts to carry out large contracts—especially during the Great Durham coal strike—were remarkably successful.

Among Sir Joseph's chief municipal works were the support of the Tees Transporter Bridge scheme; the adapting of coke oven gas for the lighting of the town; the extension of the borough boundaries; the purchase of the North Ormesby gas-works; and the abolition of the local toll-bars.

The funeral takes place at Linthorpe Cemetery to-day (Nov. 4).

Referring to Sir Joseph, "The Northern Echo" says: Middlesbrough has been rich in men of great public service. Ald. Sir Joseph Calvert served his day and generation in a way which few men have ever equalled. His memory will live long with Middlesbrough people for a wealth of devotion. He was the inspiration of many progressive departures in the communal life of the town. Cheap gas from the ironworks coke ovens was one idea which, by his initiative and persistence, he put into practice. The abolition of the toll-bars, municipal extensions, and the greater scope for educational development in the town were all the outcome of his sound, far-seeing judgment.

MR. W. H. HAMMOND.

The death occurred on Oct. 27, following a severe operation five days previously, of Mr. William Henry Hammond, of Pilleygreen Lodge, Pashley Road, Eastbourne. The sad event produced a great shock not only to the family, but to innumerable friends, who had been very hopeful of the patient's recovery. The operation involved the removal of an internal growth, and although the immediate effect was promising, Mr. Hammond weakened under the strain and ultimately succumbed.

Mr. Hammond, who was only 58 years of age, was for forty years in the service of the Eastbourne Gas Company, during the latter half of which period he filled with entire efficiency the responsible post of Engineer and Manager, a position previously held by his father, the late Mr. John Hammond. Of a cheerful and kindly disposition, deceased enjoyed the full confidence of the Directors and was very popular with the whole of the staff, in whose welfare he ever showed a warm interest.

Mr. Hammond leaves a widow and three sons.

Referring to the deceased, Mr. Sydney E. Knowles, F.C.I.S., Secretary to the Eastbourne Gas Company, says: "We have lost a good officer, a loyal colleague, and a man who inspired great affection among all with whom he was associated."

THE NEWS OF THE WEEK

The Budleigh Salterton Gas Company were awarded third prize in the class for the best trade tableau in the Annual Carnival at Budleigh Salterton on Thursday, Oct. 22.

Dividends Have Been Declared by Messrs. Meters, Ltd., of Manchester, at the following rates for the current year: On the preference shares at the rate of 5½ p.ct. per annum; on the ordinary shares at the rate of 5 p.ct. per annum. The dividend warrants will be posted on Nov. 14.

"**Gas for Water Heating**" is to be discussed at the meeting of the Midland Association of Gas Engineers, to be held at the Grand Hotel, Birmingham, on Thursday, Nov. 12, under the Presidency of Mr. H. J. Woodfine. The discussion will be opened by Mr. J. H. Paterson, of Ludlow.

According to the Gas Examiner's Report for the past quarter the calorific value of gas supplied throughout the area of Edinburgh and suburbs was 500·5 B.Th.U. per c.ft. It was free from impurity and the pressure tests throughout the area were also satisfactory. According to the Gas Regulation Act the quality of the gas supplied must be 500 B.Th.U.

Manchester District Association.—On Wednesday, Nov. 11, there will be a Joint Meeting of the North-Western Section of the Institute of Fuel and the Manchester District Association of Gas Engineers, at the Engineers' Club, 17, Albert Square, Manchester, at 6.30 p.m., when Dr. C. M. Walter of the Industrial Research Laboratories of the Birmingham Gas Department will read a paper on "Economies to be Derived from the Use of Gas Industrially."

Society of British Gas Industries.—The Autumn General Meeting of the Society will be held at the Whitehall Rooms, Hotel Metropole, London, W.C., on Thursday, Nov. 19. The general business meeting commences at 2.30 p.m., when a short report of the Society's work during the past six months will be given by the Chairman of the Council, Dr. E. W. Smith, C.B.E. The President of the Society is the Rt. Hon. Lord Eustace Percy, M.P.

Gas Companies' Protection Association.—The Thirty-Fourth Annual General Meeting of the Association will be held at Caxton Hall, Caxton Street, Westminster, on Friday, Nov. 13, at 2.30 p.m. The business of the meeting will be to receive the annual report of the proceedings of the Association, and the accounts and balance-sheet for the year ended Sept. 30; to elect the President, Vice-Presidents, and six gentlemen to serve upon the Committee in place of those retiring under Rule 12 of the Association; to elect the Honorary Auditors; and to transact other general business.

The Association of Statutory Inspectors of Gas Meters (through the local Chief Inspector of Weights and Measures) have been informed by the Bradford Corporation Markets and Fairs Committee that they are in favour of the proposed representations being made to the Board of Trade for the introduction of legislation (*a*) to secure the periodical re-verification of gas meters, and (*b*) to secure statutory verification of electric meters similar to that already governing gas meters. The Bradford Markets Committee, which is the local authority responsible for weights and measures, including testing of meters, has forwarded a copy of this decision also to the Standards Department of the Board of Trade.

Nation Wide "Buy British" Campaign.

An Opportunity for Gas Showrooms.

On Monday, Nov. 16, the Empire Marketing Board is launching throughout England, Scotland, Wales, and Northern Ireland an intensive campaign in favour of "Buying British" from the Empire at Home and Overseas. Every retail trader in the United Kingdom is asked by the Board to assist in a practical way to make this bid for the furtherance of British trade and employment an outstanding success.

Already the campaign has the active support of official and unofficial organizations in all parts of the country.

A feature of the scheme, to which the Board attaches very great importance, is the effective display in retail shops throughout the country of the special advertising material which is being prepared for the purposes of the campaign. Two new posters, setting out the appeal to "Buy British" in a simple yet striking form, have been specially designed for individual display. The posters are available in crown and double crown size, and can be obtained on and from Nov. 2 at every Employment Exchange and Local Employment office in the United Kingdom.

The Empire Marketing Board hopes that retailers who are able to exhibit these posters in their shop windows, about their premises generally, and on their delivery vans will co-operate by securing supplies from the nearest Employment Exchange and by making a striking display throughout the country on the morning of Monday, Nov. 16, and as long as possible thereafter, and so strike a decisive blow for the success of the campaign. Wherever possible, it is suggested that the exhibition of the "Buy British" posters should be backed up by special displays of Empire products.

Gas showroom displays should form an admirable means of drawing public attention to the necessity of "Buying British."

Evening Star Lodge, No. 1719.

A Regular Meeting was held in the new building at Freemasons' Hall on Wednesday last; the W.M., W.Bro. A. B. Potterton, in the Chair. After formal business had been transacted, W.Bro. J. R. Willis Alexander (Secretary to the Chartered Institution of Gas Engineers) was elected a joining member of the Lodge, and a resolution was unanimously passed amending the By-laws under which the Worshipful Masters of the Northern Star and Murdoch Lodges will become *ex officio* Hon. Members of the Evening Star Lodge during their year of office. At the close of the proceedings the Brethren dined together in the adjoining Connaught Rooms.

Members of the Institution of Gas Engineers have been invited to attend the meeting of the British Association of Refrigeration, at the Institution of Mechanical Engineers, Storey's Gate, London, S.W. 1, on Tuesday, Nov. 10, at 5.30 p.m., when Sir William B. Hardy, F.R.S., will deliver his Presidential Address. Tea will be served in the Marble Hall at 5 p.m. Admission tickets may be obtained from Mr. J. Raymond, Hon. Secretary, the British Association of Refrigeration, Empire House, St. Martin's-le-Grand, London, E.C. 1, or from the Secretary of the Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1.

Giving His Views as to the effect which the return of the National Government is likely to have upon the industry and trade of the country Mr. S. Simpson, Chairman of Willey & Co., Ltd., gas meter makers and engineers, of Exeter, said: "I believe that if the Government will deal boldly with the situation and look after the trade of the country we shall have everybody employed. We ought to trade with the people who trade with us. It has been heartbreaking to see engineering firms whose names have been household words for a hundred years close down, when, with proper encouragement to trade, they might have continued. We found that apparently even the chance of a change in the national situation had its effect. During the last fortnight our own sales have gone up considerably. I think there are great business prospects for the country if we look after ourselves."

THE NEWS—*continued.*

Institution of Gas Engineers.

By courtesy of and arrangement with the British Science Guild, members of the Institution of Gas Engineers are invited to attend the Seventh Annual Norman Lockyer Lecture, which will be given by Dr. H. H. Dale, C.B.E., M.A., M.D., F.R.C.P., F.R.S., on "Biology and Civilization" in the Goldsmiths' Hall, Foster Lane, London, E.C. 2, on Tuesday, Nov. 24, 1931, at 4.30 p.m.

The Chair will be taken by the Rt. Hon. Sir Samuel Hoare, Bart., G.B.E., C.M.G., LL.D., M.P., President of the British Science Guild. The lecture was established by the Guild as a means of periodically directing the attention of the public to the influence of science upon human progress.

Tickets for the lecture may be obtained from the Secretary of the Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1.

The Health of the Citizen.

In the second of a course of lectures on "The Health of the Citizen," delivered before the Royal Institute of Public Health on Wednesday, Oct. 21, Sir Leonard Hill said: "A dull red electric fire in a cool room gives a stuffy feeling to me and to others. We found, on taking a random sample, that about six persons out of ten were affected in this way. They felt stuffy in a room warmed by an electric fire. On the other hand, a gas fire, properly flued, and fitted with the new 'Beam' radiants, which gives a bright red glow, has no such effect. The placing of the electric fire under a wide chimney makes no difference to the stuffy feelings experienced. While my nasal airway has become obstructed when I faced an electric fire even 12 ft. away, the interposition of a screen in front of the face, or the turning of the back to the fire, immediately results in the nose opening. It is quite clear that the effect on the nose is a nervous reflex, due, not to the heated air, but to rays coming from the fire and acting on the naked skin of the face. To prove this conclusion, I cut a hole in a screen of cardboard big enough to thrust my nose through, and going close up to the electric fire, breathed up my nose the warm air coming from the front of it, while the rest of my face was screened by the cardboard. My nose remained wide open until I removed the screen, when it instantly closed. The closing effect and the consequent stuffy feelings are largely due to the congestion of the nasal sinuses, not to any element in the chemistry of the air or any poison in the air given off by the fire. It is brought about by the stimulation of the cutaneous nerves by the radiation of the electric fire.

"These effects are produced on those who have a tendency to nasal obstruction, and they may, I find, be brought about also in those who have widely open noses and do not suffer discomfort from an electric fire or a dark source of heat, by means of a partial obstruction of the nasal airway through a screw clip. If this arrangement is placed upon them, even the wide-nosed people get the same feelings as I myself experience in front of an electric fire.

"Most remarkable is the fact that the closing of the nose by the electric fire is set aside by the radiation from a glowing red gas fire or from an incandescent gas or electric lamp if sufficient to warm the skin. I have got here on the platform a glowing gas fire, in the shape of a new clinical lamp by Radiation which I have introduced at the London Light and Electrical Clinic for the treatment of rheumatism. This will open the nose. I have got on the other side an electric fire, and we can try one against the other. If the electric fire shines on my face it shuts up my nose; when the gas fire is brought on to my face or any part of the body, my nose immediately opens. If this electric fire is exposed on almost any part of my body it will shut my nose, while the gas fire similarly will open it. And that is true for others as well as myself."

Sir Arthur Duckham and the World Crisis.

At a Staff Luncheon of Messrs. Alexander Duckham & Co., Ltd., at which Sir William Morris was the guest of honour, Sir Arthur Duckham said:

A great thing has happened for Alexander Duckham & Co. in their association with Sir William Morris and his firms. That association has been won by sheer hard work on the part of everybody connected with Alexander Duckham & Co. I think the only reason you have made that association is because Alexander Duckham & Co. have never sold any bad stuff—not wittingly—and they have always given the very best they had in them in advice and service to the people they were working for. It is through that record in the country that you have this magnificent

THE NEWS—*continued.*

association that you have to-day, which gives everybody something new and special to work for.

We are going through a crisis, and the trouble of that crisis is twofold, to my mind. The first is that there is not enough gold in the world—free gold; and the second is that there are not enough " big men " in the world to manage the situation that has developed. Men and gold—of the two, far the more important is " men."

I do not mind what country you go to, or what the state of that country is, you do get situations where some industry in the country, some portion of an industry, is prosperous. Here in this country we have that very clearly shown to us, and we have Sir William here to-day who has shown us what a man can do.

As Sir William knows, and we all know, with a solid Government here, and with right direction, we shall certainly lead Europe again, if we do not lead the world. Every nation in Europe is trying to come round to the sterling standard. The whole effort of Europe, to my mind, is to co-relate its currency to sterling—not so much to gold. We are still looked upon as the leading financial country of the world, chiefly because we know how to do business. Consequently, people trust us, and we have shown ourselves worthy of the trust. I am certain that that will stand. I trust we will not misuse the majority that has been set up, but there is encouragement for one and all who are going out selling to-day, trying to get orders, after these years of hard struggle. I am at one with Sir William in his belief that the next two or three years will give us prosperity such as we have not known in the last ten years.

Some Further Potential Investments.

Recent issues of the " Financial Times " give attention to two provincial gas undertakings in their " Potential Investments " column—namely, the Portsmouth Gas Company and the Preston Gas Company.

Portsmouth.

The Portsmouth Gas Company, it was stated, was incorporated by the special Act of 1821 as the Portsea Island Gas Light Company, and only adopted its present name in 1926. In that year the Company acquired the Havant Gas Company, and as from September, 1927, that of the Emsworth Gas and Coke Company. The total area of supply is about 123 square miles, comprising the City of Portsmouth (20 square miles) and the surrounding district, including Porchester, Waterlooville and the areas served by the two undertakings above mentioned.

With the growing demand, both for domestic and industrial purposes, the Company's operations and revenue have steadily increased. During the last five years sales have risen by 15 p.ct., and during the last twenty years have more than doubled.

Interim dividends at the rate of 8 p.ct. and 5 p.ct. on the consolidated and maximum stocks respectively for the half-year were paid on Sept. 1.

Preston.

The Preston Gas Company was established in 1815 and incorporated by the Special Act of 1839. Its statutory area of supply includes the Parliamentary Borough of Preston and some dozen of townships and parishes with a total estimated population of 150,000.

During the past seven years 4737 additional consumers have been obtained, making a total at the end of 1930 of 39,201; the value of cookers, fires, and other fittings sold has exceeded £150,000 and the sales of gas have increased by over 17 p.ct. The total sales for 1930 amounted to 988,052,000 c.ft.

The fixed standard price of gas is 16·4d. per therm, and the price at December, 1930, was 10d. Dividends are subject to a sliding scale, but after providing for dividends at the standard rates and for a sum to be carried forward, any divisible profits remaining must be transferred to a capital redemption fund and applied to purchasing Ordinary or Preference stock for cancellation until £100,000 in all has been applied. So far £21,719 has been so redeemed.

Without intermission the standard dividends on all classes of stock have been maintained during the last ten years. The net revenue for 1930 was £41,144, and after deduction of mortgage and loan interest, less the Treasury payment, there remained available £26,695 for dividends on the preference and ordinary stocks.

An Example of Good Window Display

This week sees the third anniversary of the opening of the City of Lincoln Gas Department's Showrooms. Situated in the principal shopping centre, with a frontage of 40 ft., the showrooms are a prominent feature in the best business part of the city. An example of window display is reproduced, and on more than one occasion such displays have been the subject of favourable comment in the local Press. Topical subjects are introduced periodically. The back screens of the windows are removable. Occasionally these are taken away entirely, to permit the unobstructed view of demonstrations (e.g., washing machines, &c.) in the showroom. " Gas Ironing " week is another popular feature, when, by arrangement with the " Queen " Laundry Company, an ironing display is staged by their girls in the same way. Although criticized at the outset as being too ambitious, the showroom has proved an unqualified success, and its beneficial effect on the sales of gas and appliances is unquestioned. In spite of very severe depression in the local heavy engineering industries, the make of gas has steadily increased, and the demand for all kinds of appliances has developed continuously.

REVIEWS

"HOT-POT."

A Book Review by T. CAMPBELL FINLAYSON, M.Sc., M.I.Chem.E.

It has recently been pointed out that the criterion of modern knowledge is not to know a little about a lot but to know a lot about a little. Thus this age of specialization has led to the profession of Engineering being divided into many groups—Civil, Mechanical, Marine, Mining, Electrical, Gas, Chemical, and many more. A further result has been that technical literature has become more specialized, with an appeal for only a limited circle. Specialization may be necessary in these days, when each branch of applied Science is becoming more complex, but it is dangerous if it leads to lack of contact with the problems and experiences outside the immediate field of work. It is the aim of bringing together the varying experiences of the specialists in their different spheres of activity that has led to the holding of the conferences and discussions common to a group of learned Societies which have been such a feature of the past ten years. In literature the need for seeing the "other man's" point of view has been met by the production of volumes, the various chapters of which are written by specialists. Such a volume forms the subject of the present review. It is entitled "The Preparation, Selection, and Distribution of Coal,"* and is the outcome of two series of lectures upon coal arranged by the Coal Trade Luncheon Club. In response to a number of requests, the Coal Trade Luncheon Club and the Institute of Fuel decided to collect together in one volume, written in the simplest possible language, not only the substance of the lectures, but information written by experts in all the various branches of the coal industry. The producers express the hope that the volume "will be of interest and value to those who are concerned with the actual production, distribution, and use of coal."

It is not made clear in the book whether the lectures were delivered as post-prandial sedatives. If so, the organizers were more closely following the true origin of the much used word "symposium"—namely, "a banquet with philosophic conversation." It is possibly due to the association of ideas that the reviewer (without wishing to appear flippant), if called upon to convey an impression of this book, would use the one word "hot-pot." There is plenty of good meat—there is variety—there is excitement as to what one will find next—there are parts that can reasonably be called "sloppy," and there are parts which had better have been cut out.

The meat is provided to a large extent by members of the Fuel Research Staff and by Prof. K. Neville Moss. Dr. J. G. King gives a clear and carefully pruned summary of the Fuel Research Board work on the formation of coal and the coalfields. The more Dr. King can interest the Coal Trade in the Physical and Chemical Survey of the National Coal Resources the better for all industries dependent upon good coal. At a later stage Dr. King discusses the carbonization of coal in a general way. The limits of space are probably the cause for the chapter being somewhat disappointing. To give a "bird's-eye view" of carbonization —"high and low temperature"—in twelve pages is a heart-breaking task; but remembering the object of the book (to help those engaged in coal production and utilization), it is difficult to understand why, for example, the development of the coke oven is given a page of sketches, which space could have been better employed by giving a few more lines on coal blending—a subject upon which Dr. King can give valuable guidance to the Coal Trade. Prof. Neville Moss deals with coal mining from early days to the most modern methods. The chapter is well illustrated, and contains a number of interesting facts. Dr. D. T. Davies writes a chapter on preparing coal for the market, and gives a useful summary of the various types of cleaning processes—wet and dry—and discusses their applications and limitations. If Dr. Davies' chapter brings to some coal suppliers a feeling of self-consciousness concerning the high ash content of the coal they market, it will have served a valuable purpose.

Lord Hyndley, Mr. H. Cecil Rickett, and Mr. John Charrington write chapters on the Transport and Distribution of Coal, discussing sea-borne, rail-borne, and road distribution respectively. Dr. Fishenden, under the heading of the "Utilization of Coal," discusses domestic heating. The chapter is admirably clear in its theme, but must make depressing reading if the utilization of coal as such is the wish of those who read the chapter. Dr. Fishenden's views on domestic heating are sufficiently well-known in the Gas Industry to require no amplification in this review. Under "Utilization of Coal Section (*a*)-(*aa*) Domestic Heating," appears a chapter by Messrs. Gentry and Hargreaves. This makes a plea for the use of solid fuel in the form of coal. In this chapter is found a glimpse of the "post-prandial" atmosphere referred to at an earlier stage. Thus: "To lay an open fire of modern type for lighting perhaps one of the best methods is as follows: Place at the back of the grate some cinders or coal; in front of these lay some paper, and then along the front part of the grate place some pieces of coal, lay the wood across the paper and coal in such a way that a free draught is assured, and then place small pieces of coal on top of the wood. A light may now be applied to the paper. . . . Importance should be attached to having dry wood and paper. If a fire will not 'draw' when first lighted, it is sometimes due to the fact of the flue being cold."

Mr. M. A. Lewis writes a chapter on "Steam Raising" and Mr. H. L. Pirie discusses the selection and utilization of anthracite for various industrial purposes, including gas producers. The subject of coals for gas producer practice is further dealt with in a separate chapter written by Mr. A. T. Grisenthwaite. This chapter is admirable in its conciseness, and gives to the reader a clear picture of the matter being dealt with. The book concludes with a chapter on "Selling to the Consumer." Here is revealed the need for a great forward "push" by the Coal Trade. "It must be acknowledged that one does not see the story of coal told, its very real advantages put forward, its excellent selling points hammered home, as one does the story of gas and electricity. . . . There is a new generation here to-day to whom the advantages of the coal-less home are advanced with undeniable persistence and plausibility." The exploitation of counter-arguments in favour of coal and the provision of better service to consumer is urged. To help the Coal Trade in their campaign, reference is made to the psychology of salesmanship. It is shown that the salesman's only hope is to create *desire* for coal: "Desire, this potent force which alone enables us to overcome adverse factors such as Apathy, Indifference, Ignorance, Prejudice, and Price Resistance, is not created, except in the rarest circumstances, *en bloc*, but is built up. It is stratified, like coal itself, and the sales arguments advanceable on behalf of coal provide the key-works to the various strata. Cheerfulness, Hygiene, Safety, Economy, Comfort, and so on—these can all be made to yield their 'slab' of Desire, as can such general appeals as Love of Offspring, Sentiment, Conservativeness, and Æsthetic Appeal" (*sic*). So now the Gas Industry knows what it is up against!

* "The Preparation, Selection, and Distribution of Coal." A general guide for those engaged in the industry. Produced by the Coal Trade Luncheon Club and the Institute of Fuel. Published by Industrial Newspapers, Ltd., Strand, W.C. 2; price, 5s.

L. & N. PLANT.*

The test on the L. & N. low-temperature carbonization plant has now been published.

Low-temperature carbonization is generally recommended on the ground, either of the production of a solid smokeless fuel which should be equal to coal in its free-burning qualities and equal to high-temperature coke in its non-smoking qualities, or of the production of large volumes of the lighter tar oils which could be readily used as fuel for internal combustion engines and other purposes. This system produced on test 12·7 cwt. of coke per ton of coal carbonized. Something like 80 p.ct. of this coke passes through a ½-in. screen, and about 40 p.ct. through a ¼-in. screen, so that it must be briquetted before it is saleable as a solid smokeless fuel. Particulars are given in the report of a test of this fuel against a standard low-temperature coke, and it is reported that both the raw briquettes and the reheated briquettes are quite satisfactory domestic fuels.

As regards tar, the production was about 14 gallons per ton of dry coal, a figure which is not very different from those obtained in the ordinary way of high-temperature carbonization. And in quality it does not appear to differ from other low-temperature tars, except that owing to entrained coal dust it shows abnormally high "free carbon" (14 p.ct.) and pitch (50 p.ct.) contents.

There appeared to be no saleable gas as the result of the process tested.

The retort is internally heated. The fuel consumption is calculated at approximately 31 therms per ton of coal carbonized, which is compared with 25 therms with external heating, and is stated to be not bad, considering the high moisture content of the coal (over 19 p.ct.).

* Department of Scientific and Industrial Research. Report of test by the Director of Fuel Research on the plant of the Leicestershire (L. & N.) Coal Distillation Company, Ltd., at Newbold, near Ashby-de-la-Zouch published by H.M Stationery Office, Adastral House, Kingsway, W C. 2; Price, 9d. net.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

GAS AS A FUEL.

K. Bunte in "Das Gas- und Wasserfach," 1931, 74, 941-947 [Oct. 10] discusses, with the help of graphs, the principles of combustion and summarizes the advantages of gas as a fuel.

The calorific value of a gas is not the sole criterion of the value of the gas and other factors such as maximum flame temperature, ignition velocity, and speed of flame propagation have to be taken into account. The policy of the German Association of Gas and Water Engineers in recommending that town gas should consist of a mixture of coal gas and water gas of a calorific value between 470 and 480 B.Th.U./c.ft. is endorsed. The need for maintenance of constancy of composition, specific gravity, and pressure is emphasized and the figure laid down for the pressure at the consumer's appliance is 5-6 in. W.G. with a maximum limit of variation of 5-10 p.ct. above or below.

The standardization of the calorific value of town gas would enable manufacturers to improve burner design, advances in this direction being hampered under the existing conditions under which different localities supply gas of different calorific values.

GAS WASHING.

The physical principles of gas washing—*e.g.*, for recovery of benzole—are discussed by F. Schuster in "Das Gas- und Wasserfach," 1931, 74, 951-954 [Oct. 10]. Nomograms are given correlating (1) the molecular weight, partial presure, and concentration of vapour in gas; and (2) the absorptive capacity of wash oil, the washing efficiency, the ratio of wash oil to gas, and the concentration of vapour in the gas.

A graph shows the concentration of benzole in tetralin solution in equilibrium with gas of various benzole contents at different temperatures.

THE NATURE OF THE GAS OBTAINED BY HEATING COKE ABOVE ITS TEMPERATURE OF MANUFACTURE.

K. Bunte and W. Ludewig in "Das Gas- und Wasserfach," 1931, 74, 893-900 (Sept. 26) and 921-925 (Oct. 3) describe experiments on the nature and amount of the gas obtained by heating coke in a vacuum. Ten samples of coke were investigated, and these included gas-works coke obtained in continuous and in intermittent carbonizing plant and coke-oven coke. The experiments were carried out at temperatures of 900°, 1000°, 1100°, and 1200° C.

It was found that the volume of gas evolved from coke increases with the temperature and that long heating at a low temperature does not give as much gas as does two hours' heating at a higher temperature. This is explained on the assumption that coke contains various complexes which are successively decomposed at higher and higher temperatures. The gas evolved consists mainly of carbon monoxide and hydrogen, sometimes the one preponderating and sometimes the other. The composition is approximately that of a water gas.

The results obtained may be illustrated with reference to one of the samples, a gas-works coke. The heating period was, in each case, two hours.

Temperature.	C.Ft. of Gas Evolved per Ton of Coke.	Composition of the Gas.				Volatile Matter Lost. P.Ct.	Therms per Ton of Coke.
		CO_2.	CO.	H_2.	N_2.		
°C.							
900	500	4·0	56·9	30·6	8·5	1·20	1·4
1000	745	3·3	53·9	35·1	7·7	1·68	2·1
1100	1000	3·4	50·9	37·7	8·0	2·16	2·8
1200	1275	2·4	39·6	50·0	8·0	2·28	3·6

LINCOLN'S NEW GASHOLDER - -

On Oct. 26, the Lincoln Corporation placed in service a 1½ Million Holder erected by Newton Chambers & Co., Ltd.

The holder is of the spiral-guided type, with mild-steel tank. The soil excavated for the tank was 8896 tons, and the material used in the reinforced concrete foundations included 150 tons of cement, 310 tons of sand, 593 tons of gravel, and 18 tons of steelwork. This work was carried out by M. Otter & Co., Lincoln.

There are two coats of red lead oxide paint on all ironwork, one coat of silica grapholine paint, and a final coat of green. The total weight of paint is approximately 10 tons. The number of rivets in the structure is some 400,000. The pressures thrown are: Inner lift, 7 in.; inner and middle lift, 10 in.; all three lifts, 12 in. The whole of the material used is of British manufacture, and the total weight of steelwork is 956 tons.

OPENING CEREMONY.

There was a large attendance at the inauguration ceremony, which was presided over by the Chairman of the Gas Committee (Councillor A. L. Bower). He was supported by the Mayor of Lincoln (Councillor C. H. Doughty) and Mrs. Doughty, the City Sheriff (Mr. George Wright, A.M.I.M.E., who is also the Gas Engineer and Manager), Mrs. Wright, and members of the Corporation.

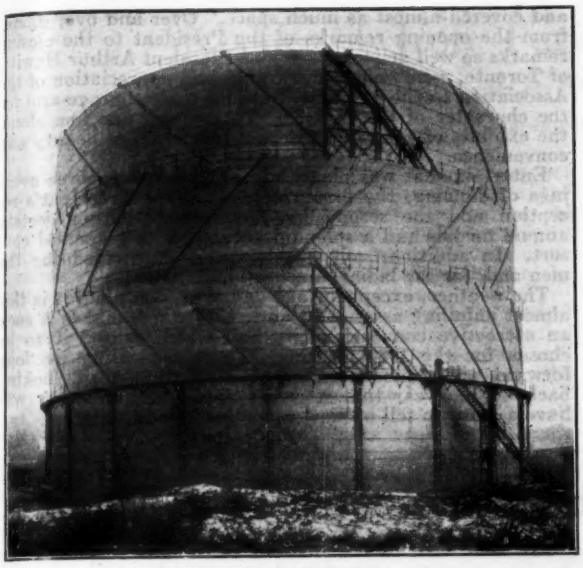
The CHAIRMAN, introducing Mrs. Wright, said that for some years the Gas Department had been working at a disadvantage owing to inadequate storage capacity, but for various reasons the matter had been allowed to drift until early last year, when it was thought advisable to go forward with the new holder, as a most suitable scheme to help unemployment. The Government inquiry was held just about the time Mr. Wright was appointed Engineer and Manager, and in consequence they were able to avoid the expense of a Consulting Engineer. After visiting the Continent and viewing the latest types of holders, the Engineer recommended the Council to adopt the spiral-guided type. In the last ten years the output of Gas in Lincoln had increased by 25 p.ct.; and last year, in spite of the depression in the city, the increase was over 12 million c.ft. "This new gasholder," concluded Mr. Bower, "will stand as a sign of progress."

Mrs. GEORGE WRIGHT, who was then invited to turn the gas into the mains, said: "I think it is most appropriate that a woman should perform this opening ceremony, because, after all, gas is the housewife's friend. Gas is without doubt the cheapest form of lighting, heating, and cooking, and in consequence the housewife is able to balance the weekly budget more easily. This new gasholder will be a splendid landmark to gas as a public servant, and a fine example of British skill, British workmanship, and British business methods."

Subsequently the party were entertained at tea by the hospitality of the Contractors, and Mr. H. Brader gave the toast of "The Mayor and Corporation."

The MAYOR, responding, said that some people were inclined to cavil at showrooms and propaganda in connection with municipal trading concerns; gas appliances had been improved out of all knowledge in the last few years, and they must have some means of bringing this before the public. The continued progress of the Department was bound up with showrooms and publicity. Cookers, fires, &c., were sold last financial year to the extent of over £6000. Until the Gas Department started pushing the sales of these articles, the volume of trade did not amount to a fraction of that figure.

Mr. WRIGHT, in giving the toast of "The Contractors," re-



Lincoln's New Gasholder.

ferred to the reconstruction scheme of the gas-works. This, he said, would not involve any charge on the rates; on the contrary, in a short time it should result in lower price for gas. He was prepared to guarantee an annual saving of at least £10,000 per annum. In addition, it would find a great deal of employment for the local firms during the coming winter, and the whole scheme would require in local wages approximately £22,500. "When the scheme is completed," continued Mr. Wright, "we shall have a plant on up-to-date lines to compare favourably with others. With regard to the new holder, I can assure you it has been a real pleasure to me to carry out the work, and particularly so as I have all along felt I had the full confidence of my Chairman, and the Council generally, and also the contractors. In this connection, I should like to associate myself with the reference to Messrs. Newton, Chambers, & Co., Ltd., as many of you know I have had a lifelong experience in the construction of gasholders and gas plant in general, and I can say that the holder you have had the opportunity of seeing to-day is one of the finest it has been my privilege to view. It reflects the greatest credit on the contractors, the workmen, and those who have been in charge of the job. It would ill become me if I did not make reference to the foreman on the job, Mr. Bee, who has been so diligent in his duties, and also particular reference to Mr. Fairey, to whom, I think, a large portion of the credit is due for the work being completed one month under the specified time, in spite of the inclement weather. I should also like to thank the Superintendent, Mr. Bowden, and Mr. Enright, for the assistance they have given me in connection with the work."

Major MILES, representing the Contractors, responded. He said the Lincoln Gas Committee were extremely keen. He had had the pleasure of showing them round some modern works, and one would have thought they were all qualifying for gas engineers by the number of questions they put to his staff. Mr. Wright had had previous experience, and their relations with him had been extremely cordial. The result was that Lincoln had a holder, one of about a dozen they had put up this year, second to none in the country.

Major Miles then presented Mrs. Wright with a silver fruit bowl as a memento of the occasion, and, concluding, said his firm had been very happy to be of service to Lincoln.

Mrs. WRIGHT thanked Major Miles and his firm for their gift.

AMERICAN GAS ASSOCIATION CONVENTION

As Viewed by a Special Correspondent

Once it was quite possible to summarize, even within the space available in your "JOURNAL" to the proceedings of a foreign association, the addresses and reports of our national gas convention. How impossible this is to-day may be appreciated by stating that in the 13th Annual Convention of the American Gas Association held in Atlantic City from Oct. 12 to 16, six hours were devoted to general sessions and no less than thirty-seven hours to meetings of seven distinct sections. No less time than this would suffice to meet the requirements of the nearly five thousand persons who were in attendance.

The opening session was marked with the usual flavour of internationalism, as evidenced by the telegrams of good wishes from British and European Gas Associations, and the election to honorary membership of the Presidents of those societies. This year, however, the presence on the platform of Sir Francis Goodenough, C.B.E., and Mr. J. H. Canning, O.B.E., brought us nearer than ever to the British Gas Industry and afforded an occasion for some very pleasant amenities of international courtesy, in the introduction by President Paige of the two distinguished guests and the references made by them to the pleasure and profit derived by the British gas men from Mr. Paige's visit last summer.

The Treasurer's Report, by the size of its figures, emphasized the strength of a united industry in a country as large as ours. Receipts and expenditures approximating $1,000,000 each, with a balance in various funds of about $300,000, imply not only large resources, but also the obligation to use these resources efficiently. For this purpose, a Control Committee has been constituted, and its activities were described in the Address of President Paige and more fully elaborated later in the presentation of the Association's programme for the next five years.

The President's Address was in the main a summary of all the phases of Association work. At the close, after stating that in the last decade customers had increased 40 p.ct.; gas sales, 110 p.ct.; and revenues, 61 p.ct., he added: "*A united industry is ready*, ready for the added responsibilities, ready for the opportunities for enlarged public service, ready to sell more gas." This emphasis on the necessity and the opportunity for increased sales was the keynote of the whole convention, both in the general sessions and in the sectional sessions, more particularly those of the Commercial Section. In this connection, Sir Francis twice gave us the benefit of his wide experience.

The report of the Managing Director, Alexander Forward, with its statistics for 1930 and the first eight months of 1931 of manufactured and natural gas, bore testimony to the great stability of our industry, for the comparison between 1931 and 1930 showed a loss in sales of only 2 p.ct. in manufactured and 9 p.ct. in natural gas.

RESEARCH.

The Managing Committee of the Association's Testing Laboratory listed nine lines of research for next year, at a cost of $257,000. Half of this is for appliance testing and is reimbursed by the testing fees. Three interesting lines of research are recuperation ("Recuperation offers definite possibilities for increasing the efficiency of most industrial gas appliances"); elimination of noise in industrial gas burners; research on combustion space requirements ("While only a start has been made on this investigation, it is believed that the results obtained from it will form the foundation for the solution of many present industrial gas problems").

Mention was made above of the emphasis given to selling more gas. This received more elaboration in a paper, "Gas is the Logical Fuel," by Morse Dell Plain, President of the Northern Indiana Public Service Company, who preached only what he has practised with eminent success. He spoke of the responsibility devolving on the combination gas and electric companies, of which there are very many, to limit the field of electricity to light and power, and for all fuel purposes push the sale of gas. The best opinion in this country sides with him and is opposed, as being against public policy, to the aggressive merchandizing of electric ranges and water heaters to the detriment of gas appliances, by those companies controlling both gas and electricity.

In the cooking field, gas was first and electricity is the newcomer. In refrigeration, the reverse is true, for electricity had no sooner revealed the possibilities of iceless refrigeration than gas stepped in to show its superiority. In three years, 180,000 gas refrigerators have proved their worth and the sales figures for 1931 greatly exceed those for 1930. The value of this refrigeration business was the subject of a Commercial Section paper. The gas refrigerator

makes easier the retention of the gas range and the sale of other gas appliances.

Thought-provoking addresses were "Exploiting Ideas," by Dr. Zay Jeffries, of Cleveland, and "What is Ahead," by B. C. Forbes, of New York. The first mentioned some wonderful uses of gas in industry and the possibilities of still more marvellous service. The second speaker said that the gas industry had shown a real example to the other industries in America by the manner in which it had gone ahead during the past year. He also pointed out that, as the man in the street was becoming more and more the boss of public opinion, it became increasingly important that the gas companies tell this man day in and day out, in language he could understand, the details of their business as affecting the price it was necessary to charge for gas and the service being rendered for this charge.

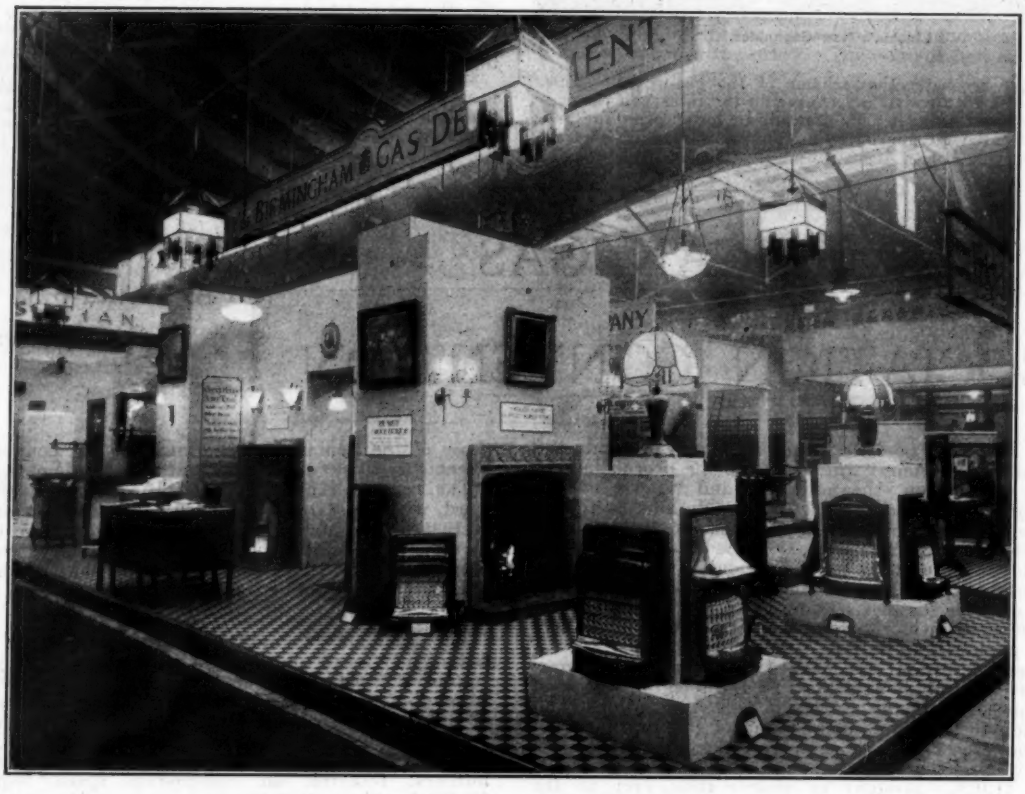
THE CONVENTION EXHIBITION.

One of the most gratifying features of the convention was the size of the exhibition. With two hundred exhibitors, the display was in quality ahead of any previous one, and covered almost as much space. Over and over again, from the opening remarks of the President to the closing remarks so well delivered by Vice-President Arthur Hewitt, of Toronto, were voiced the thanks and appreciation of the Association to the manufacturers for their courage and for the character of their wares. To mention one line alone, the exhibits of gas ranges were a revelation of beauty and convenience.

Entertainment was plentifully provided with three evenings of dancing, the first preceded by the President's reception and the second by the presentation of certain annual medals and a splendid vocal and instrumental concert. In addition, golf privileges were provided for the men and, for the ladies, luncheon and cards.

The weather, except for one day, was ideal; and it is this almost unfailing asset of Atlantic City which makes it such an attractive convention city and which caused it to be chosen for the 1932 meeting. To that meeting we look forward with confidence, for we know that then, looking back on the year that now lies ahead, our industry will have a story to tell of hard work and steady progress.

Gas in the Home



A MODEL DISPLAY AT BINGLEY HALL.

The Birmingham Building Trades Exhibition naturally makes its appeal primarily to the architects and builders, but there is always a good attendance of prospective house purchasers. The stand of the Gas Department was therefore erected and equipped with a view to interesting these particular sections of the Department's customers. All the domestic uses of gas were exemplified by specimen appliances correctly fitted. Special care was taken, both in the design of the stand and in the sales talks, to impress upon architects and builders the need for adequate ventilation.

Four modern gas fires were fixed in appropriate settings, with modern bracket lighting; and, as a special feature, facing one end of the stand, a "Metro" log grate with a stone mantel attracted a great deal of attention.

Different methods of heating the garage were demonstrated and a good range of hot water appliances suitable for Birmingham water was on show. Full use was made of specially written notices, each giving the salient points of one particular piece of apparatus. These served the double purpose of engaging the attention of the casual visitor and of providing excellent introductions to enable the salesman to open conversations with prospective purchasers.

The stand was constructed of "Celotex" left with its natural finish. The "Celotex" board was mounted on a wooden framework and gave a solid appearance to the various stand partitions, which proved very effective.

Midland Junior Gas Association.

About sixty members of the Midland Junior Gas Association paid a visit to the works of Messrs. Westwood & Wright, Ltd., Queen's Cross, Dudley, on Saturday, Oct. 24. The visitors spent a most instructive afternoon, great interest being shown in the construction of a new 72-in. diameter gas valve.

At the conclusion of the inspection, tea was provided by the courtesy of the Directors, during which a vote of thanks was proposed to the Directors and Members of the Staff by the President, Mr. W. L. S. Spinks.

In acknowledging the vote, Mr. Frank Wright said how pleased they were to have had the opportunity of showing their various processes to the visitors, and he commented upon the success of their new valve, which he stated they were exporting to several foreign countries, in spite of tariffs up to 80 p.ct.

Oxide of Iron Purification of Coal Gas

By R. H. Clayton, B.Sc., H. E. Williams, and H. B. Avery, M.Sc.Tech.

[Abstract of a Paper presented to the Manchester District Association of Gas Engineers, Oct. 9]

Much has been published recently on the various wet purification systems, claiming their advantages over the old oxide purification method, but to be just to the old servant it is necessary to put forward a claim for the results which can be obtained in a well-designed plant using a suitable oxide of iron mixture, and it is only fair to make comparison on such a basis.

It is apparent to one whose life has been spent in control of chemical operations that the necessary chemical control of many of the wet purification methods put forward will be both complicated and expensive; and allowances for the requisite chemical staff seldom appear in balance-sheets.

The fact that oxide of iron will function under the most variable conditions, delivering a pure gas from a crude gas containing varying quantities of noxious impurities, is a great tribute to its merits.

From the thorough examination of a spent oxide much can be learned of the working conditions under which it has been produced, although it is necessary to obtain many further details in order to determine whether the oxide has worked to the best advantage.

Before proceeding further it is essential to enumerate the many various reactions which result in the formation of the bodies found in spent oxide, and below are given the reactions which actually take place in the boxes during the purification process.

The following reactions take place between the sulphuretted hydrogen in the gas and the ferrous or ferric hydroxides in the oxide:

1. $Fe(OH)_2 + H_2S = FeS + 2H_2O$.
2. $2Fe(OH)_3 + 3H_2S = Fe_2S_3 + 6H_2O$.

The sulphides oxidize with oxygen from the gas or during external revivification as follows:

3. $2FeS + O_2 + 2H_2O = 2Fe(OH)_2 + S_2$.
4. $2Fe_2S_3 + 3O_2 + 6H_2O = 4Fe(OH)_3 + 3S_2$.

While the iron content of the oxide is mainly in a sulphided condition, hydrocyanic acid is absorbed according to the equation:

5. $3Fe(OH)_3 + 6HCN = Fe_3Fe(CN)6 + 6H_2O$.
6. $3FeS + 6HCN = Fe_3Fe(CN)_6 + 3H_2S$.
7. $6Fe_2S_3 + 24HCN = 4Fe_2Fe(CN)_6 + 12H_2S + 3S_2$.
8. $2FeS + 2NH_3 + 6HCN = Fe(NH_4)_2Fe(CN)_6 + 2H_2S$.
9. $2FeS + 5HCN + NH_3 + CO = FeNH_4Fe(CN)_5CO + 2H_2S$.
10. $FeS + S_2 + 2HCN = Fe(CNS)_2 + H_2S$.

Ammonia and hydrocyanic acid combine with sulphur in the oxide to form ammonium sulphocyanide:

11. $2NH_3 + 2HCN + S_2 = 2NH_4CNS$.

The ammonium sulphocyanide thus formed may enter into the following reactions depending on the conditions prevailing:

12. $2NH_4CNS + FeS = Fe(CNS)_2 + 2NH_3 + H_2S$.
13. $2NH_4CNS + FeO = Fe(CNS)_2 + 2NH_3 + H_2O$.
14. $CaCO_3 + 2NH_4CNS = Ca(CNS)_2 + 2NH_3 + CO_2 + H_2O$.
15. $Fe_4[Fe(CN)_6]_3 + 6NH_4CNS + 2H_2S = 3Fe(NH_4)_2Fe(CN)_6 + Fe(CNS)_2 + 4HCNS + S_2$.
16. $2Fe_7(NH_4)_2[Fe(CN)_6]_6 + 18NH_4CNS + 7H_2S = 12Fe(NH_4)_2Fe(CN)_6 + 2Fe(CNS)_2 + 14HCNS + 7S$.

The ferrous sulphocyanide formed as in equations 12 and 13 given above may further react as follows:

17. $12Fe(CNS)_2 + 3O_2 - 8Fe(CNS)_3 + 2Fe_2O_3$.
18. $2Fe(CNS)_3 + Fe = 3Fe(CNS)_2$.
19. $4Fe(CNS)_3 + 2H_2S = 4Fe(CNS)_2 + 4HCNS + S_2$.
20. $12Fe(CNS)_3 + 12CaSO_4 + 3O_2 = 2[Fe_2(SO_4)_3]_2Fe_2O_3 + 12Ca(CNS)_2$.
21. $12Fe(CNS)_3 + 12(NH_4)_2SO_4 + 3O_2 = 2[Fe_2(SO_4)_3]_2FeO_3 + 24NH_4CNS$.
22. $Fe(CNS)_2 + 2NH_3 + H_2S = 2NH_4CNS + FeS$.

The following reactions have also been found to occur during the purification process and should therefore be mentioned here:

23. $12FeSO_4 + 3O_2 = 2[Fe_2(SO_4)_3]_2Fe_2O_3$.
24. $4Fe_2(SO_4)_3Fe_2O_3 + 12H_2S = 12FeSO_4 + 2Fe_2S_3 + 12H\ O + 3S_2$.
25. $FeSO_4 + Ca(CNS)_2 = Fe(CNS)_2 + CaSO_4$.
26. $FeSO_4 + 2NH_3 + 2H_2O = (NH_4)_2SO_4 + Fe(OH)_2$.
27. $FeSO_4 + 2NH_3 + H_2S = (NH_4)_2SO_4 + FeS$.
28. $FeS + 2O_2 = FeSO_4$.
29. $(NH_4)_2SO_4 + FeS = FeSO_4 + 2NH_3 + H_2S$.
30. $4Fe(OH)_3 + 8HCNS + 2H_2S = 4Fe(CNS)_2 + 12H_2O + S_2$.
31. $2Fe_2S_3 + 8HCNS = 4Fe(CNS)_24H_2S + S_2$.
32. $2HCNS + Fe = Fe(CNS)_2 + H_2$.
33. $2NH_3 + CS_2 = NH_4CNS + H_2S$.
34. $2H_2S + O_2 = 2H_2O + S_2$.
35. $[Fe_2(SO_4)_3]_2Fe_2O_3 + Fe_2O3 = 2Fe\ (SO_4)_3Fe_2O_3$.

Many of these reactions are of comparatively minor importance under normal working conditions, but under unusual conditions sometimes become of the greatest importance, and it is to these minor reactions (the results of which may be detected in spent oxides) that one must look for the explanation of faults which cause the simple operation of oxide purification to give unusual or abnormal results.

We propose, therefore, to examine the problems of oxide purification by first considering the final product obtained, namely, spent oxide.

Sulphur in Spent Oxide.

The sulphur content of spent oxide varies very considerably, oxides being marketed at from 40 p.ct. sulphur to 60 p.ct. sulphur.

It is, of course, of the greatest importance from the economic point of view that the engineer should remove from the foul gas the greatest quantity of sulphur per unit of fresh oxide bought, consistent with the smooth working of the boxes and production of a satisfactory purity of the town gas. In order to decide which of two samples of oxide has given the better service it is not sufficient to examine merely the sulphur percentage of the samples. The only true comparison is obtained by calculating the sulphur percentage on the original dry oxide present in both cases.

The following table gives the results obtained under actual working conditions at an English works removing 600 tons of sulphur per annum from the coal gas and using deep purifiers.

In this case 65 p.ct. sulphur was obtained in the spent oxide as shown in column F. The columns A to E show varying results and quantities of fresh oxide required if the oxide had only risen to the lower sulphur percentages.

Ratio: Fresh Oxide to Spent Oxide.

—	A	B	C	D	E	F
Moisture	7·0	7·0	7·0	7·0	7·0	7·0
Sulphur	40·0	45·0	50·0	55·0	60·0	65·0
Tar soluble in $C.S_2$	1·5	1·7	1·9	2·0	2·2	2·4
Ammonia	0·5	0·6	0·7	0·8	0·9	1·0
Cyanogen	1·0	1·2	1·4	1·6	1·8	2·0
Dry oxide base	50·0	44·5	39·0	33·6	28·1	22·6
	100·0	100·0	100·0	100·0	100·0	100·0
Dry base as fresh oxide, 38 p.ct. moisture	80	71·6	62·7	54·0	45·2	36·4
Ratio sulphur to fresh oxide	2·01	1·6	1·26	1·0	0·75	0·56
Fresh oxide required for 600 tons sulphur	1206	960	756	600	450	336

From these figures it will be seen that the economy of increasing the sulphur content of the spent oxide above 50 p.ct. is very great, and that if it is possible to produce spent oxide containing a high percentage of sulphur the saving in fresh material used is a considerable item.

Moisture in Spent Oxide.

It has been observed in the examination of a very large number of samples of spent oxide that the higher sulphur content is almost always associated with a high moisture content, calculated on the original base used. This leads to the conclusion that purification conditions which favour a retention of moisture are conducive to more efficient working of the oxide.

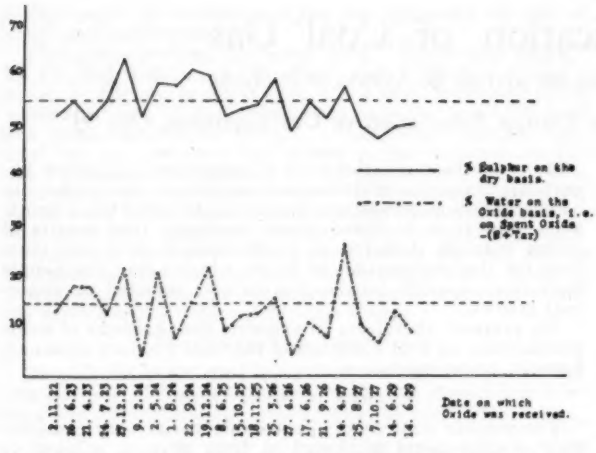
Laboratory research has amply justified this conclusion, and it may be definitely stated that a moist oxide is much more active in absorbing both sulphuretted hydrogen and hydrocyanic acid than a dry or partly dry mixture.

Our experiments clearly prove that air-dried oxide is very inefficient as an absorber of sulphuretted hydrogen or hydrocyanic acid from the gas stream, and that moisture is essential for the reactions between sulphuretted hydrogen or hydrocyanic acid and the oxide.

In the following diagram the moisture and sulphur contents of the spent oxide from one station where the same fresh oxide was used during the whole period are shown.

The moisture percentage has been calculated on the original dry oxide present and the sulphur on the dry spent oxide basis. The results show very clearly the relationship between sulphur absorption and moisture content, the sulphur content falling when the moisture is not present to aid the reaction.

In several works in England it is now customary to re-



Effect of moisture on amount of sulphur absorbed : Chart showing how the percentage of sulphur in successive deliveries of spent oxide from the same gas-works fluctuated with the moisture content.

moisten the oxide *in situ* by opening the box and spraying the oxide with water until a sufficient degree of humidity has been reached. This operation may be repeated several times before the box is emptied. At other works wet steam is introduced for this purpose, and in order to obtain the maximum benefit the steam is fully saturated by blowing through water. It is found that the moisture in oxide acts beneficially in other ways. It is primarily the medium in which the reactions take place—that is, it absorbs the gaseous impurities, thus bringing them into intimate contact with the iron hydrates and promoting the reaction.

A further important function of the moisture, especially in the fresh oxide when first put to work, is that each unit of water may be replaced by two units of sulphur without increasing the resistance of the oxide mass to the flow of the gas.

An excessive moisture content must, however, be condemned, as in this case the high specific heat of the water prevents or delays the rise in temperature caused by the reactions, and the oxide is rendered sluggish and in extreme cases may remain so cold that it becomes almost inactive. Our experience is that an original moisture content of 35 p.ct. to 40 p.ct. is highly satisfactory, if the oxide be capable of retaining this quantity of water without losing its porosity.

In order to obtain the most satisfactory and economical working it is not sufficient to control the moisture only when the mass is placed in the boxes, but the working conditions should be so regulated that the bulk of the moisture remains in the material to aid the reactions. The material when taken out for revivification should therefore still contain well over 10 p.ct. of moisture, which will maintain the mass in a suitable condition to be re-wetted and leave the iron in a hydrated and active condition for further working. When purification conditions favour this maintenance of the moisture content of the mass, the oxide will be found to give the highest efficiency and most economical results.

Tar.

The CS_2 soluble tar content of spent oxide from the purification of coal gas may vary from 0·5 p.ct. to 4 p.ct., and in extreme cases spent oxides containing even as high as 7 p.ct. have been encountered. A general average figure for modern practice may be taken as under 1·5 p.ct. The presence of tar in spent oxides is not merely objectionable from the point of view of the acid maker who is not generally prepared to offer so high a price for an oxide containing over 1·5 p.ct. tar, but it is a very objectionable impurity from the point of view of efficient working of the purifiers.

It is, therefore, advisable to reduce the tar-fog content of the gas to a minimum, and many methods are now available for eliminating the suspended mist before the gas enters the purifiers. Of the numerous systems proposed, electrostatic precipitation probably gives the most complete elimination of suspended mist, although one of the largest gas-works in England consider it economical to employ three Livesey washers in series and so reduce the tar to 0·5 p.ct. in the spent oxide. We have found that a simple apparatus, consisting of a tower packed with porcelain rings and adjusted to yield a back pressure of 4-in. water gauge, gives very good results, removing up to 80 p.ct. of the suspended particles.

For details of the separation of tar fog from gases and estimation of the tar content, reference may be made to a paper read before the Manchester District Institution of Gas Engineers in June, 1907, by R. H. Clayton and F. W. Skirrow. Where tar fog and naphthalene occur together difficulty is frequently experienced owing to the formation of an almost impervious layer on the surface of the oxide mass, which raises the resistance to the gas flow to such an extent that the box has to be opened and the surface broken up. This is not so serious in the event of downward flow being in use, but with upward flow the oxide will have to be thrown out of the box. In this connection it may be opportune to point out that in the case of downward flow the surface exposed is twice that in the case of upward flow, as the ordinary grid has less than 50 p.ct. free space, so that the same quantity of tar arrested by the oxide surface will cause the oxide to develop resistance twice as rapidly with upward flow as compared with downward flow.

The Cyanogen and Ammonium Compounds.

In considering the cyanogen and ammonium compounds found in spent oxide it has been found so difficult to classify separately the reactions which take place that the two sections have been combined, and it is hoped that the text will enable these conditions to be understood clearly.

The hydrocyanic acid is absorbed by the ferrous iron oxide and sulphides from the crude gas to form several compounds. It reacts with the iron sulphides to form ferrocyanides, carbonyl ferrocyanides, and there is distinct evidence in many spent oxides of the presence of some ferro-pentacyanides. The ferrocyanides may exist as ferrous, ferric, and ferro-soferric ferrocyanides with varying amounts of the basic iron replaced by ammonium and pyridine.

The sulphocyanides are produced by the combined action of the hydrocyanic acid and ammonia on the free sulphur always present in partly spent oxide in the purifiers. They may also be produced by a number of subsidiary reactions and may exist in the spent oxide as the sulphocyanides of ammonium, iron, or calcium. Hydrocyanic acid is only absorbed and fixed in the oxide in the boxes by ferrous hydroxide or the iron sulphides; it is not absorbed by ferric hydroxide. It follows from this that the hydrocyanic acid in the gas is not absorbed by fresh or fully revivified oxide, but only by the sulphided or partly revivified oxide.

Effect of Oxygen.

The amount by volume of hydrogen sulphide present on an average in the foul gas in this country is about 1 p.ct. The oxygen necessary to oxidize this quantity of hydrogen sulphide is 0·5 p.ct. by volume.

The presence of this quantity of oxygen in the foul gas as it enters the purifiers, although theoretically sufficient to oxidize all the sulphide in the boxes, is so dilute when mixed with the gas that it will have only a small oxidizing effect during its passage through the boxes and a large proportion will pass unchanged. At least twice the theoretical quantity is necessary in practice. Even with this excess of oxygen, revivification in the boxes where rotation is practised is taking place over a much wider area than sulphiding. The hydrogen sulphide is mainly absorbed in the first box and is generally complete in the second. It is evident that the reaction between hydrogen sulphide and ferrous and ferric hydroxides proceeds much faster than the reaction between oxygen and ferrous and ferric sulphides. The depth of oxide necessary to remove the hydrogen sulphide from the gas is much less than the depth of sulphided oxide required to remove the corresponding quantity of oxygen. As these reactions take place mainly through the medium of the water wetting the oxide, the oxidation will necessarily be slower than the sulphiding, oxygen being much less soluble in water than hydrogen sulphide (the respective solubilities being: oxygen 0·034 p.ct. and sulphuretted hydrogen 2·9 p.ct. by volume).

This slower rate of oxidation is, of course, the main reason for the rotation of the boxes, so that the sulphided oxide may be taken out of the sulphiding zone, and while still in the gas stream have time to revivify before it again meets the foul gas. It has a longer contact with the gas containing oxygen and no hydrogen sulphide than with the gas containing both oxygen and hydrogen sulphide. The rate of reaction between the oxygen and the iron sulphide increases with rise of temperature. When the oxygen content of the gas is increased the rate of oxidation increases owing to the greater oxygen concentration, and the temperature will rise locally owing to the heat evolved by the reaction.

The heat evolved by the reaction between the iron sulphides and oxygen in the revivification process is very much greater than that given out in the reaction between hydrogen sulphide and the iron oxides in fouling.

The greater the speed with which the foul gas travels through the boxes the greater the depth of oxide required

to absorb the hydrogen sulphide if oxygen is practically absent. The introduction of oxygen tends to counteract this effect, and the amount introduced into the boxes should be carefully regulated and kept at the minimum necessary for smooth working. It is important that the sulphided layer be as deep as possible, not only to absorb the hydrocyanic acid as the harmless blue and not as sulphocyanide, but in order to prevent excessive local high temperature. It will be seen that a too localized action, particularly that due to excess oxygen, should be avoided, for apart from all other considerations the heat generated locally may be excessive.

A small depth of sulphided oxide will fix only a portion of the hydrocyanic acid as blue, some acidic ferrous sulphocyanide will also be formed, while the remainder will pass away with the gas stream to the holders and into the town's supply. If ammonia be passed freely into the boxes a large amount of ammonium sulphocyanide will be formed, and if the local temperature of the shallow sulphided zone rises about 100° to 110° F. a very considerable amount of ferrous salts will be formed. This condition is liable to give rise to serious corrosion of the bottom plates of the purifiers and other troubles.

In a works where the purifying capacity is adequate for the gas make, and where the oxygen and ammonia can be carefully regulated and kept to a minimum, no purification troubles should be experienced; the oxide would be kept moist throughout, readily worked up to 50 p.ct. of sulphur, and 95 to 96 p.ct. of the total hydrocyanic acid in the gas absorbed in the oxide mainly as harmless "blue," and only a very small portion fixed as sulphocyanide.

Effect of Ammonia.

The ammonia at the inlet to the purifiers should be kept as constant as possible; any extreme variation or the release of a sudden flood of ammonia, when the boxes appear to be a little sluggish, is not good practice.

The reaction between iron oxide mixture and the constituents of foul coal gas will, in the absence of alkali, gradually develop acid conditions—that is to say, soluble iron salts will be formed. Acidity in the oxide considerably retards the absorption of hydrogen sulphide and more especially hydrocyanic acid.

A slight alkalinity considerably assists the absorption both of the hydrogen sulphide and hydrocyanic acid by the oxide in the boxes, and up to 4 grains of ammonia per 100 c.ft. is usually ample for this purpose.

If the ammonia entering the boxes rises above the necessary quantity to which reference has been made, the hydrocyanic acid will be fixed in increasing quantities, but as ammonium sulphocyanides instead of ferrocyanides. If the ammonia is in large excess two or three times as much sulphocyanide as blue will be formed.

Examination of a great number of spent oxides from different gas-works over a period of years has shown, almost without exception, that the sulphocyanide varies as the ammonia. The formation of large amounts of ammonium salts in the oxide is a potential source of danger, and may give rise to very serious troubles. In those works where rotation is practised and clean coal gas is passing through a box of sulphided or partly sulphided oxide containing a large amount of ammonium sulphocyanide, or sulphate, a reaction takes place between the ferrous and ferric sulphides and the sulphocyanide or sulphate, forming ferrous sulphocyanide or sulphate with evolution of ammonia and hydrogen sulphide. The latter is almost instantly absorbed by the iron hydroxides in juxtaposition, while the former passes away with the clean gas (Equation 12).

When clean coal gas is passed through sulphided oxide containing ammonium sulphocyanide at a slow rate at the ordinary temperature traces of ammonia are being continually given off and carried away by the gas stream, while ferrous sulphocyanide is formed in the oxide.

If the temperature of the oxide be not allowed to rise above 70° to 80° Fahr. no serious difficulties occur; if, however, the temperature of the oxide be allowed to rise in the boxes or during external revivification, either generally or locally, very considerable troubles may arise. In these circumstances a strongly acidic oxide is produced.

Acidity in the oxide may also occur, though to a smaller extent, during the reduction of the "blue" by hydrogen sulphide when the box becomes first taker. Ferric ferrocyanide, formed by the oxidation of the ferrous compound during rotation of the boxes or outside revivification, is reduced by the hydrogen sulphide in the gas when the box again becomes first taker.

When the fouled oxide is exposed to the air and thoroughly revivified the soluble ferrous sulphate will be oxidized to the insoluble basic ferric sulphate (Equation 23). The ferrous sulphocyanide will oxidize in like manner by reaction with the ammonia or calcium sulphates almost invariably present in the oxide (Equations 20 and 21). This basic ferric sulphate is insoluble in water, and the acidity may escape detection if the oxide be tested for soluble iron salts after thorough revivification. When, however, the oxide is fouled in the boxes this basic salt is reduced by the hydrogen sulphide in the foul gas and the ferrous sulphate and ferrous sulphocyanide reproduced in their original soluble form (Equations 24 and 25), and the oxide will become strongly acidic.

The formation of soluble iron salts not only inhibits absorption of hydrogen sulphide and hydrocyanic acid, but may cause serious corrosion of the boxes.

The ferrous sulphocyanide solution will be alternately oxidized by the oxygen in the gas, and reduced by the iron of the bottom plates of the boxes (Equations 17 and 18).

Apart from the troubles mentioned above, an excess of ammonia in the foul gas stream entering the boxes may, in exceptional circumstances, give rise to difficulties of quite a different nature. If through a breakdown of the ammonia scrubbers, or other cause, an excess of ammonia be passed into the boxes, sufficient to pass through all the boxes and the temperature allowed to rise to 100° Fahr. or over, strong traces of hydrogen sulphide may develop in the gas stream immediately after it leaves the boxes. This trouble is caused by the reaction of the ammonia with carbon disulphide, always present in the clean gas, forming hydrogen sulphide and ammonium sulphocyanide (Equation 33).

Tests for Hydrocyanic Acid and Ammonia.

The hydrocyanic acid in the clean gas after leaving the boxes may be very accurately estimated by a method we have worked out in the laboratory, and very extensively tested under practical working conditions. A small stream of gas from the outlet of the purifier is led into a glass tube 18 in. long by ½ in. internal diameter, packed with a special sawdust mixture containing sodium carbonate and precipitated nickel carbonate, and then through a meter. The hydrocyanic acid is completely scrubbed out of the gas by this mixture to form sodium nickel cyanide.

$$Na_2CO_3 + Ni\ O_3 + 4HCN = Na_2Ni(CN)_4 + 2H_2O + 2CO_2 \qquad 297C$$

the green nickel carbonate changing to the orange yellow of the double cyanide.

The reaction is so rapid and complete that the change of colour from green to yellow may be observed as it progresses up the tube, the unchanged nickel carbonate being separated by a sharp line of demarcation from the completely converted double sodium nickel cyanide. If the tube be packed with a standardized nickel mixture the hydrocyanic acid in the gas may be estimated, with a close approximation to the truth, by measuring the length of the column of the mixture converted into cyanide and the volume of the gas passed through the tube.

This sight test may, if desired, be checked by washing the tube out with water into a distilling flask, acidifying with an excess of dilute sulphuric acid and distilling the liberated hydrocyanic acid through a condenser into dilute caustic soda solution. When the hydrocyanic acid has been completely driven off into the alkaline solution, the cyanide in the latter is then estimated by titration with standard N/10 silver nitrate solution after adding a few drops of potassium iodide solution as indicator. We have not yet succeeded in applying this test to the foul gas containing hydrogen sulphide, and have so far found no better test than the usual polysulphide test.

The usual control test of the ammonia entering the boxes is, according to our experience, unsatisfactory, and we should like to describe here a simple sight test devised to give a rapid means of estimating the free ammonia content of the unpurified gas. The tests usually taken, and which may indicate that the ammonia content of the gas is about 4 grains, are not confirmed by examination of the spent oxide, which generally shows an average of as much as 10 grains, 4 grains being seldom shown. The ammonia actually present in the spent oxide can only originate from that present in the crude gas.

A further fault is that in the usual test the result is not quickly obtainable.

We have, therefore, worked out a test similar to that already described for the estimation of the hydrocyanic acid passing the boxes. In this test standard acid is used in place of the nickel sodium carbonate. Great difficulty was experienced in obtaining an indicator not decomposed by sulphuretted hydrogen, but, ultimately, bromphenol blue was found to be satisfactory. The use of sawdust as an absorbent for the standard acid presented considerable difficulty, owing to the crude gas causing discoloration of the sawdust which could not be completely overcome by pre-treatment of the sawdust with the usual purifying chemical reagents, and the colour change of the indicator from yellow to blue is, therefore, not as sharp as desirable. In order to obviate this difficulty we selected a hydrolized cellulose acetate, which can be ob-

tained in the desired granular form, as a more suitable medium for absorbing the acid.

To prepare the testing material a mixture of standard sulphuric acid with a 1 p.ct. spirit solution of the indicator is added gradually to the cellulose and thoroughly incorporated with it.

The estimation itself is carried out by measuring the length of the coloration produced by a measured volume of gas, and will be found to be accurate to 10 p.ct. compared with the direct absorption in acid. The colour change is very striking and gives a rapid sight test which can be observed and carried out by the purifier foreman.

Purifer Control.

The importance of the presence of a controlled quantity of ammonia in the crude gas has already been very fully discussed, and it only remains to say that this control is difficult to obtain by regulation of the supply of water to the scrubbers, owing to fluctuations of temperature and consequent alterations of the solubility of the ammonia in the scrubbing liquor. The simplest method of avoiding this difficulty is always to keep the gas at the outlet of the washing and scrubbing plant free of ammonia, and to by-pass approximately 2 p.ct. of unwashed gas from the exhauster directly to the foul gas inlet of the purifiers.

To take the last trace of ammonia out of the gas would naturally lead to dilution of ammoniacal liquor. A simple method of avoiding this is to use the last two bays of the washer purely as a means of finally extracting the last traces of ammonia with excess water and running this wash water away, as it is of no value. The water to be used for the ordinary washing is introduced directly into the third bay from the end, and passes in counter current to the gas in the usual way. This method has been adopted in several cases where difficulties have arisen due to excess of ammonia passing into the purifiers.

The control of the quantity of oxygen or air to be added to the crude gas so as to enable revivification *in situ* to be carried out is not difficult. In many stations the necessary air is admitted on the suction side of the exhausters, either by " drawing " in the retort house or at the inlet condensers or at the inlet of the exhauster itself. The objection to the first two of these methods is that ammonia is fixed as sulphocyanide and thiosulphate, according to the following equations:

$$(NH_4)_2S_2 + NH_4CN = NH_4CNC + (NH_4)_2S$$
$$2NH_4HS + 2O_2 + (NH_4)_2S_2O_3 + H_2O$$

owing to the formation of ammonium polysulphide by oxidation of the sulphide in the condensers.

It is preferable, therefore, to admit the necessary air at the purifier inlet, either by means of a small rotary blower or steam injector, and in order to obtain constant results the quantity should be measured by meter.

Working of the Purifiers.

The most usual method of present-day working is probably that in which a set of four boxes is worked in backward rotation, with or without catch boxes, with revivification *in situ*. In this case sufficient air must be added to the gas stream to bring the oxygen content of the gas entering the purifiers up to from 0·9 p.ct. to 1·3 p.ct. by volume, the higher figure being required where the box capacity is on the low side. With this system, using catch boxes, it has been proved possible at several large stations to obtain fully spent oxide in one exposure only.

This method may be worked successfully without catch boxes if the box capacity be large and oxide of high activity is employed. It is necessary, however, in this method of working to keep two clean boxes—that is to say, two boxes which show no trace of sulphuretted hydrogen in the gas leaving the box; which means that only 50 p.ct. of the purifier capacity is being utilized for sulphur absorption at any one time.

If a catch box is employed, it is possible to work with one clean working box, thus utilizing three-fifths of the total capacity. Forward rotation may also be employed with revivification *in situ*, although this method is not so widely practised. With this method the primary box or first taker is placed immediately as last taker when the set is rotated. It is essential, therefore, to have a catch box, as otherwise the foul gas contained in the box, when moved from first to last taker, passes immediately into the purified gas stream.

Difficulty is sometimes experienced when emptying the purifier owing to overheating of the oxide due to rapid oxidation of the sulphides of iron. This trouble is less in the case of revivification *in situ* than in the older system of external revivification, as partial oxidation at least has taken place before the box is emptied. It is, however, always advisable as a precaution to avoid emptying the fully sulphided box, and, where backward rotation is used, to empty the box from the position of last taker, when it will have had time to cool and partly revivify with the excess oxygen during the passage from first to last taker.

With regard to catch boxes, several points of interest arise which may be briefly mentioned.

In normal working of the set the oxide in the catch box has little or no action to perform, and becomes, therefore, very cold and acts to some extent as a condenser for the moisture carried by the gas from the warmer working boxes. The oxide thus becomes excessively moist and cold and tends to become less active for these reasons.

Further, when the mass is not changed for long periods the slight but continual deposition of naphthalene oil and gummy bodies forms a coating on the oxide particles which further lowers the activity of the mass. Cases have come to our notice in which oxide after being in the catch box for long periods has at first refused to work when placed in the working set.

It is for these reasons that we are strongly in favour of the system of working the catch box or boxes in turn with the main set—that is, not to use catch boxes as such, but to have a working or rotating set of five or six boxes all of which have equal work to perform, preventing any one box becoming unduly moist or inactive.

Such a system of five or six boxes worked on backward rotation gives a high proportion of effectively working oxide out of the total mass in the set, and the moisture is conserved, being driven forward through each box in turn. The advantages of downward flow as compared with upward flow have already been mentioned, and it may be said safely that where conditions permit, " reverse " flow—that is, changing from upward to downward flow and vice-versa—gives a greater flexibility in working and enables the oxide to be more fully utilized.

A further improvement is the introduction of " divided " flow with reversing valves where the gas is introduced centrally into the oxide mass and flows upwards and downwards, and where it may be reversed to flow in the opposite direction through the layers of oxide.

The resistance of the oxide to the gas flow is always constant and the depth of oxide halved for the same flow of gas, thus reducing the back pressure to half that thrown by a single layer exposing the same quantity of oxide to the same flow of gas.

For comparative purposes for different sets we calculate the number of cubic feet of gas passing through one cubic foot of oxide in one hour in one box.

Expressed in equation form this reads:

$$R = \frac{\text{cubic feet of gas per hour make}}{\text{cubic feet of oxide in one box}}$$

This figure gives the time contact ratio which is a true basis on which to compare box capacity.

In modern practice R equals 25/30, although figures as low as six and, in one extreme case, as high as sixty have been encountered. In this latter case the reaction was so forced that the oxide was always strongly acidic in nature, and an excess of ammonia in the gas had failed in keeping the oxide neutral owing to the reactions previously described. A great improvement in the working was obtained by increasing the depth of the layers and using a less resistant oxide mixture than formerly.

At the present time it is quite common practice for single layers of oxide of 3 ft. and even 4 ft. in depth to be used, and by careful control of condition in the boxes to obtain up to 50 p.ct. sulphur content in one exposure only, in certain cases. By this method a considerable saving in labour cost and in replacement of grids is effected.

Condition of the Oxide Mass.

In order to work with such deep layers without difficulty, an oxide mass must be employed which gives a low resistance to the flow of the gas and is of an open and porous nature. Although the chemical reactions which take place during the purification of crude coal gas by means of oxide of iron mixtures are of very great importance, the physical condition of an oxide mass which will give satisfactory results under widely varying conditions at different stations has to be very carefully studied.

It is obvious that the activity of an oxide must depend chiefly on two factors—namely, the chemical activity of the hydrated oxide and the surface exposed in contact with the foul gas. The iron content of the oxide, therefore, should be fully hydrated and so spread on the surface of lightening material that a thin film is exposed to the gas, so giving a maximum possible surface for reaction. The lightening material should be porous and absorbent, so that no resistance to flow is offered and the moisture is conserved and retained until replaced by sulphur as the reaction proceeds. The mass itself should be of such an open lattice structure that it will not tend to crush under its own weight in deep layers. It is further of the utmost importance that the engineer should be able to rely upon

the supplies of oxide being standard and not fluctuating from the usual iron and moisture content to which the works conditions have been adjusted.

Comparison of English Purification Systems with Modern German Practice.

We feel that this paper would be incomplete if no reference was made to the trend of coal gas purification on the Continent, where Ruhr Gas A.G. have adopted oxide purification and have recently installed further oxide purification plants to deal with purified coke oven gas.

This large increase in the sale of purified gas and consequent installation of very large purifier sets is due to the growing demand for sulphur-free gas for the steel industry, as it has been found that, in addition to the benefits obtained by the use of gas, such as regularity of product and output, the pure gas gives a greatly improved quality of steel plate. The total quantity of coke oven gas to be purified in the Ruhr district during 1931 was estimated at 290 million c.ft. per day. In the newly erected purifying plants deep boxes with multiple layers of oxide and reversing flow of the gas stream have been installed. The usual practice is to use eight layers of oxide each approximately 16 in. deep, giving a total of 10 to 11 ft. of oxide in one box. In some plants each box holds 450 tons of oxide mass. The gas passes through one layer of oxide only, the direction of flow being frequently reversed.

The boxes are rotated as required on the backward rotation principle. The purifiers themselves are constructed entirely of steel plate, cast iron being considered unsuitable for this type of construction. Great economies in ground space required and capital cost are effected. In one plant, purifying 16 million c.ft. per day and only occupying a plot of ground 220 ft. by 55 ft. for fresh oxide storage, compressor house and boxes, the total cost of the plant, including two rotary compressors, was only £20,000. A similar system of purifier lay-out is also used by some of the larger city gas undertakings.

In all these installations it is claimed that the oxide rises in one exposure to 45 to 50 p.ct. sulphur on the wet basis, and that external revivification is unnecessary. The material, when once exposed, is loaded directly into rail wagons for disposal. With a lighter and more porous oxide mass than that employed at present it should be possible somewhat to deepen the layers of oxide, thus using fewer layers and grids. The quantity of oxide exposed in each box is 1 cub.m. per 1000 cub.m. of gas per day, giving a time contact ratio of 1:40, compared with 1:25/30, which is the usual practice in this country.

At the Thyssensche Gas und Wasserwerke in Hamborn, Dr. Lenze has erected a purification plant of unusual design, which commenced operation this year.

A very detailed description of this plant has appeared in the "Gas und Wasserfach," May 16, 1931, and a short abstract in the "Gas Journal" for June, 1931. The plant is capable of purifying 1·2 million cub.m. per day, and at present only three sets of four towers are working; the fourth set will be in operation shortly. The four sets will purify 42 million c.ft. per day.

The oxide is placed in double layers in trays, fourteen of which trays are contained in each tower purifier. The gas is introduced between the layers from a centre feed and passes through a single layer of oxide to the annular space between the trays and the body of the tower, and thence to the outlet.

Those interested in the details of this plant will find the lay-out fully described and illustrated by photographs in the above publication ("G. & W.," May 16, 1931) and in the English Patent No. 345880.

While we are not concerned with the building of purifiers, nor do we wish to be drawn deeply into the engineering details associated with the purification of gas, we feel that Continental practice suggests the advisability of considering the following points:

1. The deepening of the existing 6-ft. English boxes to enable them to contain up to twice the volume of oxide per unit of ground space.
2. Avoiding increased back-pressure by the introduction of divided flow.
3. The use of reversing valves to enable the oxide to be worked under the most favourable conditions.

The deepening of the boxes by 2 ft. will give a depth of 8 ft., and permit the use of two 2 ft. 9 in. layers instead of the two 1 ft. 9 in. layers in use at present. Divided flow enables longer contact of the gas with the oxide to be obtained without increasing the resistance; and reversing the direction of flow favours the retention of moisture and enables the oxide to become fully spent without excessive local hardening of the material.

As already stated, the common practice in this country is to obtain a 50 p.ct. sulphur spent oxide in two or more exposures with a time contact ratio of 25 to 30, and it is our opinion that if the quantity of oxide exposed to the gas were increased to make this ratio 12 to 15, in most of these stations a 55 p.ct. to 60 p.ct. spent oxide could easily be obtained, with the probability of reducing the oxygen content of the purified gas.

In the earlier part of this paper particulars were given of an oxide which reached 65 p.ct. sulphur. The purifiers in this case are deep boxes, giving a long time contact, although reversing valves are not installed in this case. The economy of material and labour which can be effected has already been fully emphasized.

Yorkshire Junior Gas Association

Annual Meeting

The 28th Annual Meeting of the Yorkshire Junior Gas Association took place on Oct. 24, at the Fuel Department of Leeds University. Mr. J. W. Horwill (Bradford), retiring President, occupied the chair and a large attendance included as visitors Messrs. E. J. Sutcliffe, late Gas Engineer and General Manager of the Bradford Gas Department (a former President of the Association); Mr. J. Bridge, Engineer and Manager to the Elland-cum-Greetland Gas Company; and Mr. A. S. Haynes, Manager to the Rotherham Corporation Gas Department. Mr. H. Singleton, Engineer and Manager to the Huddersfield Corporation Gas Department, was present to give the address customary at the annual meeting.

The annual report, presented by Mr. John R. Firth (Acting Hon. Secretary), stated the membership of the Association to be 215, a net increase of six for the year.

The financial statement, presented by Mr. H. E. Wilde (Treasurer), showed a credit balance of £80, as compared with a credit last year of £88.

The Report and Accounts were adopted on the motion of Mr. F. Clegg (Huddersfield), seconded by Mr. J. Hargreaves (Bradford).

New Officers.

The following officers were elected for the ensuing year:

President.—Mr. J. W. Holroyd (Rotherham).
Senior Vice-President.—Mr. J. W. Wood, M.Sc. (Leeds).
Junior Vice-President.—Mr. B. Thorpe (Huddersfield).
Hon. Treasurer.—Mr. H. E. Wilde (Bradford).
Hon. Secretary.—Mr. J. R. Firth (Bradford).
Assistant Hon. Secretary.—Mr. T. G. Lewis (Leeds).
Council.—Messrs. R. N. Webb (Leeds), A. Wylie (Sheffield), J. W. Carlton (Shipley), and S. T. S. Musgrove (Sheffield).
Representatives on Yorkshire District Education Committee.—Messrs. C. H. Chester (Wakefield), J. W. Horwill (Bradford), R. N. Webb (Leeds), and A. Wylie (Sheffield).
Hon. Auditors.—Messrs. A. W. Arnold (Bradford) and F. Lodge (Wakefield).

Mr. Holroyd, in accepting the Presidency, handed to Mr. Horwill the gold medallion which it has become customary for the Association to present to the retiring President as a memento of his year of office.

Mr. Horwill, in response, said the Presidency always carried a certain amount of responsibility, but it was a high honour and one which he had appreciated.

A vote of thanks was awarded the retiring President, officers, Council, and Education Committee, on the motion of Mr. V. J. J. Siddons (Barnsley), seconded by Mr. T. J. Lewis (Leeds). To this Mr. H. Wilde responded on behalf of the Council and Mr. C. H. Chester on behalf of the Education Committee Representatives.

ADDRESS

of Mr. H. Singleton, Engineer and Manager, Huddersfield Corporation Gas Department.

Education for Young Gas Engineers.

The education or preparation of a young man for the profession of a gas engineer is, I feel, a subject which has received a good deal of thought and consideration by the Council of the Institution of Gas Engineers. I am aware that whatever proposals are put forward are open to debate and criticism. There is no doubt, however, that the syllabus drawn up by the Institution of Gas Engineers for examination in the various grades leading to the Diploma

Examination is exceedingly good. It must also be borne in mind that it takes a good deal of time and hard work to obtain the Diplomas, after gaining which a young engineer has reached such an age that he begins to think it is time to slow down a little and employ some of his evenings in other directions, and to a certain extent I should be one to agree with such a diversion of attention. Every young man, when he commences his training, has some ultimate attainment in view; and it suggests itself to me a matter worthy of consideration that as the syllabus set out by the Institution of Gas Engineers takes one through a well defined course of general education as a preliminary, and afterwards through a course of more or less specialized education (which on the successful completion thereof one is then enabled to become a member of the Institution of Gas Engineers) that an attempt might be made to prepare for, and pass at the same period the examinations of the Senior Institution—namely, the Institution of Civil Engineers. Some of you may think this a tall requirement, but I venture to say that quite a number of you are eligible, and could easily bring off the double event.

Take, for instance, the Institution of Gas Engineers preliminary examination subjects, and compare them with the Civils' preliminary examination subjects. In the Diploma Examination, Matriculation standard is required as a preliminary, and the same applies, with the qualification to include trigonometry, in the Civils. Compare the Ancillary subjects of the Gas Engineering Course with Section A of the Civils. The Civils' Section A subjects are: (1) Mechanics, (2) Strength and Elasticity of materials, (3) Electricity and Magnetism, (4) Theory of Structures or Theory of Machines (four to be taken); of Section B only two are to be taken, and I select five, any of which are useful in Gas Engineering—Hydraulics, Thermo and Electric Chemistry, Mineralogy, Applied Chemistry, and Theory of Heat Engines. Section C is Engineering and Drawing, Specifications, and Quantities. You can select from the above seven subjects, one of which, Applied Chemistry, includes Gas Manufacture, leaving six subjects which could be used as ancilliary subjects for the Gas Engineering Diploma Examination (which requires seven subjects additional to Gas Engineering Course itself). I think this aspect of studying for obtaining membership of the Institution of Civil Engineers for those beginners who are articled or apprenticed to Gas Engineering is well worth careful consideration. In putting forward this idea I do not wish you to imagine that I am hinting at a depreciation of the value of membership of the Institution of Gas Engineers, but I do say that membership of the Civils is generally regarded as the Hall Mark of an Engineer.

These suggestions are, of course, put forward and apply mainly to the pupil who intends to obtain his education and practical experience on a works at the same time. They are not put forward as a competitive scheme to University training for a Degree, which is in itself a whole-time job.

Coke.

The 1930 Board of Trade Returns for the Gas Industry show that 11,913,000 tons of coke and breeze were produced by gas undertakings in this country. Assuming (say) 75 p.ct. of this total to be saleable, there should be nearly 9 million tons of gas coke for sale. The total number of gas consumers is now over 9 millions, and therefore there is one ton of coke available for every consumer. But, of course, large institutions and offices (for central heating), industries, and works (steam raising, &c.) take large quantities which, with the existing domestic use, is approximately 92 p.ct., leaving about 750,000 tons as surplus. This quantity is shipped at whatever prices can be obtained; we are, in fact, at the mercy of the foreigner, who naturally put us into competition with other coke producing countries and the coke oven producers. It would be a credit to the Gas Industry if, by canvassing or any other methods, we could induce each of our 9 million consumers to absorb nearly 2 cwt. of coke more than he is using. The surplus coke question as far as export was concerned would then disappear.

Some undertakings are doing very good work in educating and inducing their consumers to use coke. Halifax, for instance, sell small quantities of vertical coke in paper bags very successfully, and I am sure they are to be congratulated on doing really fine educative business. In passing I must point out that it is essential to produce and sell dry coke; water is for quenching purposes and not for sale. Halifax, for example, could not put up wet coke in paper bags—they would never be able to handle the bags.

Again, the surplus, particularly in times of industrial depression, tends to increase considerably, and external markets are more difficult to obtain. The result is that prices for coke become depressed, and often there is the prospect of having to increase the price of gas to make a balance. Not only does depression in industry increase this surplus, but competition from other sources becomes keener; by this I refer to the efforts of the coke oven industry to capture what at one time were considered the safe markets for gas coke. Our coke oven friends are sparing no efforts to produce a coke suitable for the domestic market. I have seen numerous samples of oven coke which are almost indistinguishable from horizontal gas coke. On the other hand, when we have analyzed these furnace cokes we find the ash content to be 10-13 p.ct., and the moisture 3-6 p.ct. compared with horizontal gas coke: Ash 7 p.ct. and moisture 3 p.ct. But for central heating, and with this greater ash content, furnace coke has an advantage in non-clinkering over gas coke. The reason seems to be that the washing of the slack prior to coking chiefly removes the iron content which is the most easily fused and clinker forming ash, and the remaining ash is necessarily so evenly distributed throughout the furnace coke that during combustion it falls away and through the grate bars as dust.

On the other hand, gas-making coal being generally large coal or nuts, any ash to be found is in the form of continuous strata and bats, and as the coal before carbonizing is usually broken only to about 1½ in. to 2 in. cube, the scales or bats may be any size up to 2 in. long and enter and leave the retorts without alteration. In use, therefore, gas coke ash, partly in the form of scales or bats, collects on the grate bars and is fused where the temperature is most intense into clinker which, besides being laborious to remove, interferes with the access of air to the fire. I am not singing the praises of furnace coke, but merely pointing out where—particularly when a fire has to be pushed hard—furnace coke does not clinker so readily as gas coke appears to do, even when the latter has a smaller ash content.

We must know all what we can about our competitors, and we must also know the good qualities of gas coke, which is more easily ignited, gives a rather longer flame, has more life in the furnace, is more open in texture, which assists in producing more complete combustion and greater efficiency, will burn satisfactorily where draughts are poor, has a less weight of ash, and therefore more combustible matter, and is a local product. In selling gas and gas appliances we have showrooms to demonstrate the appliances, and salesmen and canvassers to push the goods and secure orders and satisfy consumers, and even to offer maintenance services. What do we do with coke customers?—just take their orders, send them the coke, and then send the account? Our competitors, usually through coal merchants, are continually canvassing our customers for furnace coke orders, and sometimes make rather exaggerated claims for furnace coke against gas coke. Why shouldn't every gas undertaking of 150 million c.ft. annual production and over, have its coke canvasser, who should be not merely a person calling for orders, but one qualified to discuss fuel qualities, efficiencies of use, and practical application to obtain the best results—in other words a solid fuel technician and salesman? I have seen numerous cases where coke is wasted and used most inefficiently, both in process work and central heating. The correct regulation of draught, primary and secondary air, and depth of fuel, are all important matters on which useful advice could be given by a gas-works trained coke salesman. My opinion is that a gas-works training with its chemical and engineering practice and the special knowledge of solid and gaseous fuel heating is one of the best possible training grounds for a fuel technician and salesman. We have in our Industry the right atmosphere, the right men, the right fuels—gas and coke. I could say the most efficient smokeless fuels. We ought therefore to look after this business and hold it against our competitors by making personal visits and assisting our customers with our knowledge, thereby retaining the fuel markets and incidentally getting a reasonable price for our coke.

Gasholders.

A regular inspection system of gasholders should be carried out by the engineering staff at fixed intervals, and also following every gale and every severe frost. If this is done thoroughly, just as boilers are inspected, and reports kept for comparison, and provided repairs are immediately attended to, gasholder accidents will be very rare. Due to a few accidents which occurred two or three years ago the Board of Trade are considering the compulsory insurance and examination of gasholders on parallel lines to steam boiler insurance. Some insurance companies have already gone so far in preparation as to obtain the services of engineer-inspectors to examine holders for which they hold policies. We certainly do not wish for interference in this matter from the Board of Trade, which would be like handing over part of our plant, as though we were incapable of taking proper care of it ourselves. The interference which we should welcome from the Board of Trade is some sound boosting of our Industry on similar lines to

that given on behalf of the electricity industry by the Rt. Hon. Herbert Morrison, Minister of Transport of the late Labour Government.

During the last three years I have had three holders re-sheeted and erected two new ones, and have been able to gather very interesting data regarding the condition of old holders. One in particular, which was 66 years of age and was made of wrought-iron throughout gave some rather interesting results, which were as follows:

The sheeting had reduced two gauges from its original thickness, the outside of the sheeting still bearing the rolling scale, the reduction in thickness having taken place entirely from the inside. Test pieces were cut from these sheets at various points, and when submitted to a tensile test gave 14·01 tons per sq. in. as the yield point. A test section cut from one of the tie-rods gave a yield point of 14·33 tons per sq. in., and a 26 p.ct. extension on a length of 8 in. These particulars all show that holders have a very long useful life with ordinary care and regular attention. No annual inspection provides so much information or is as useful as that which is accumulated by constant attention and observations of those who are responsible for its good working.

Hearty thanks were awarded Mr. Singleton, and the meeting also expressed its thanks by resolution to the authorities of Leeds University for the ready facilities granted for meetings held there.

After the meeting the members and visitors adjourned to the Griffin Hotel, Leeds, for high tea, followed in the evening by the annual smoking concert.

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDERS.

Bideford Gas and Coke Company, Ltd.

To sanction and confirm the purchase by the Company of the undertaking of the Great Torrington Gas Company, Ltd., to make provision with reference to the raising of further capital, &c.

Shanklin Gas Company.

To transfer to, and vest in, the Company the undertaking of the Ventnor Gas and Water Company. Consolidated ordinary stock of the Shanklin Company is to be issued to holders of Ventnor shares.

Progress of Pipe Joint Research.

By K. R. KNAPP, Chief Engineer, American Gas Association Testing Laboratory, Cleveland, Ohio.

[A Contribution to the Distribution Conference of the American Gas Association, April, 1931.]

(*Continued from p. 156.*)

VIBRATION.

The subject of vibration of cast-iron mains has received considerable attention over the past few months. The preliminary work done consists principally of some field observations made largely to determine if such vibrations as occurred in practice could be measured. These were then supplemented by some experiments in the Laboratory. In order to make suitable field observations, it was first necessary to select an instrument which would measure or otherwise indicate the vibrations which were expected to be encountered. An instrument known as the telemeter was rented for this purpose and used throughout this investigation. Its essential parts consist of a series of small carbon discs, the electrical resistance of which is varied by any movement or vibration of an object to which the instrument is attached. The extent of this change in resistance is indicated by the deflection of a sensitive galvanometer, which throws a light beam on a moving film. A camera attachment is used to photograph the movement of the light beam which serves as a measure of the intensity of the vibration. It should be remembered that all observations give only a relative indication of the vibration intensity encountered. To obtain an absolute measurement, calibration of the instrument would be necessary.

Twin elements were used, each being bolted to the face of a 12-in. piece of ½-in. angle-iron so that vibrations in planes 90° apart could be measured.

In applying this instrument to a main an excavation was made a little to one side of the point at which it was decided to mount it and the main exposed by tunnelling so that the original soil about the pipe would be disturbed as little as possible. The angle-iron carrying the elements was attached by band iron clamps to the main with one face horizontal, the other vertical. The necessary electrical leads were then run through an iron pipe conduit to a nearby building or in some cases to a tool wagon

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parked within a reasonable distance. An excavation was first made to permit mounting the instrument. This was then back-filled and after the observations were completed was re-opened and the instrument removed. All the actual observations were made at the point where the recording apparatus was set up.

Observations were taken at four locations on mains varying in size from 8 in. to 12 in. Two of these locations were in Cleveland and two in Detroit. All were in streets where heavy traffic was encountered, but none was in the central district as it was not thought necessary to go to the additional trouble and expense which would have been involved in making the necessary street openings.

The first location selected in Cleveland was largely for the purpose of determining the suitability of the instrument for the purpose and to learn the best way of operating it. This main selected was comparatively close to the curb and for that reason probably less subject to the effects of traffic than any of the other mains on which observations were taken; notwithstanding this fact, it was found readily possible to detect the movement of the main. The other locations were selected to secure further information under conditions where it was felt the vibrations which might occur would be far more severe.

From the measurements which have been taken, it was found that certain basic facts seemed to apply. In all cases the most severe vibrations of the main in question were secured by the passage of street cars on the side of the street nearest to the main. Passage of street cars on the opposite track produced much lower vibration intensities. This intensity seemed to be somewhat increased by the presence of street car track intersections at cross streets, especially when these were rough. Some measurements were taken at a point about 50 ft. from such intersections and these developed the highest intensities encountered. Contrary to what was expected, automobile traffic even in the case of heavy trucks with solid tyres, did not cause any very large amount of vibration. The intensity from this source was very much less than was encountered from street cars, notwithstanding the fact that some of the motor trucks passed directly over the main.

Cover of the Main.

No definite statement as to the effects of cover of the main on the intensity of vibration can be made from the results secured on account of the other variables involved. The smallest main on which observations were taken was also the deepest and the highest intensities were recorded in its case. The two 12-in. mains which differed considerably in cover also showed some variation in intensity of vibration; but this may be explained somewhat by differences in location of the main nd the character of the soil. Two of the locations in which observations were made were in a sandy soil. One was filled ground and the other clay. The traffic conditions were probably worse in the case of the filled ground, and this main was also the smallest, both of which factors may have influenced the vibration encountered.

It may be mentioned here that higher intensities of vibration were recorded from street cars which approached an intersection at a low speed than occurred when cars were travelling in an open street at a speed of possibly 35 miles an hour. Here, however, soil conditions as well as the paving were different.

Several laboratory tests were made to determine whether it was possible to secure leakage of joints by the application of an external force which would produce a very extreme condition of vibration on the joint used. These experiments were made on 6-ft. lengths of 4-in. and 6-in. pipe with the joint in the centre, which had previously been used for bending tests. The plan followed was to bolt them firmly on supports placed 5 ft. apart, and then to attach a foundry vibrator to the pipe in various positions in respect to the joint. Vibration was produced by admitting compressed air to the vibrator up to a maximum of about 50 lbs. per sq. in. Such leakage of the joint as was produced was found to depend very largely upon the location of the vibrator in respect to the joint.

With the vibrator suspended directly from the bell, or from the pipe in front of and close to the bell, with a pressure of 10 lbs. maintained on the joint, it was possible to cause leakage as the intensity of vibration was increased by raising the air pressure. However, it was found on further investigation that the leakage produced was due mainly to a deformation of the bell or pipe caused by the bolting to it of the clamps securing the vibrator. When the vibrator was placed on the pipe behind the bell, no deformation at the joint resulted. It was found that the amount of leakage produced when the vibrator was operated in this position was almost negligible. In fact, out of six 6-in. joints so tested, only one was found to leak. This joint was of cement; the others which remained tight were cast lead.

(To be concluded.)

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Quotations submitted.

NOTES ON PLANT AND PROCESSES

Some Lead Wool Company Products.

Hitherto it has been difficult to test the joints of a large main as the work progresses, owing to the enormous quantity of water or air required for each successive test and the difficulty involved in blanking off to sustain the enormous end thrust.

The new testing apparatus of the Lead Wool Company, Ltd., of Snodland, Kent, illustrated in fig. 1, consists essentially of three pieces of steel—*i.e.*, one centre drum and two outer angle steel rings, with two specially constructed tyres which, when inflated, make a joint between the main and the apparatus. In addition, for high-pressure tests, a side plate is provided for each tyre.

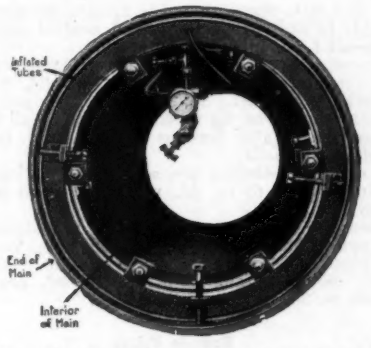

Fig. 1.—New Joint Tester Shown Fixed in End of Steel Main.

The apparatus has been made to test to any pressure from a smoke test to 260 lbs. per sq. in. The usual procedure when testing gas or air mains is to pump the tyres up and apply the test either with a motor car foot pump or an air compressor (the latter is preferable). The patent joint testing apparatus is recommended for pipes of 30 in. diameter and upwards.

In a leaflet issued by the manufacturers full instructions for the use of this apparatus are given.

Gas engineers should be interested in the joint for mains illustrated in fig. 2. It is well known that there is a great strain on joints where the ground is liable to movement or subject to severe vibration. It has been found that the introduction of a hollow vulcanized rubber ring has given remarkably good results.

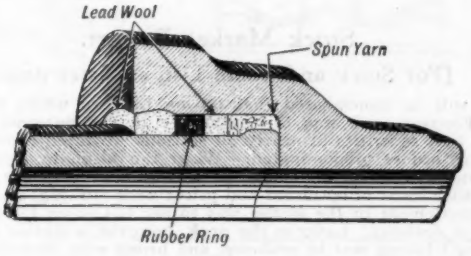

Fig. 2.—A High-Efficiency "Lead Wool" Joint.

The method of procedure is to caulk spun yarn at the back in the ordinary way, then a collar of "Lead Wool" about $\frac{3}{8}$ in. in depth to compress the spun yarn. This collar of "Lead Wool" should be faced up as evenly as possible. The rubber ring is then inserted and the "Lead Wool" caulked on top. The rubber ring, which is tight on the spigot, is slightly bigger than the joint space and is compressed between the two collars of "Lead Wool." The rubber provides a considerable amount of flexibility, and keeps the joint tight when any movement takes place.

This joint has been tested to 100 lbs. of air without showing any leakage. It is specially recommended for consideration in connection with bridge crossings under severe vibration and springing.

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Positive Measurement.

No. 245.—BRADDOCK'S 1500 LTS. WET METER.

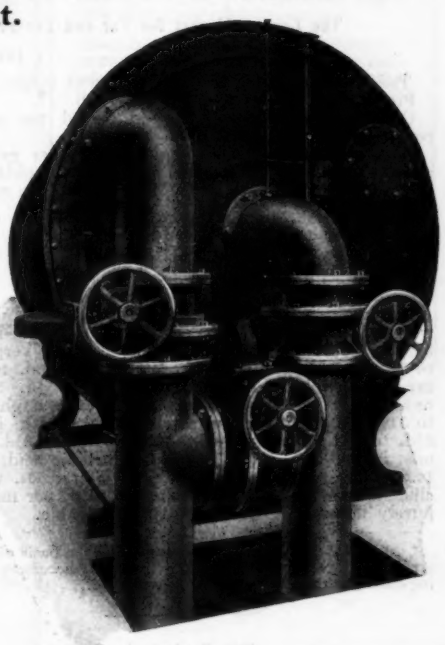
In Cylindrical Cases, for from 500 to 30,000 cubic ft. per hour.

The Best in the Market.

Dimensions and Full Particulars upon application.

OF SUPERIOR QUALITY AND CONSTRUCTION.

May be seen working up to full capacity before delivery.



No. 10a.—BACK VIEW OF ROUND METER, WITH SLIDE VALVES AND BY-PASS.

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GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

It will be remembered that during the two weeks prior to the Election such was the confidence in the outcome of the issue that securities in nearly all sections advanced rapidly and buying orders predominated. When the ultimate result was known, therefore, the enormous Government majority caused a further burst of optimism and prices went still higher, though the excitement in the House was rather too much for any extensive dealings. Later in the week, however, a certain amount of profit-taking was in evidence, and prices were brought down to more reasonable levels.

As in many other sections the volume of business in Gas stocks and shares was somewhat adversely affected by the momentous events of the week, but prices remained firm, and several preference and debenture issues continued to make further improvement. The most important of these was that of the Gas Light and Coke 4 p.ct. preference which rose 5 points to 76½, and is now only 3 points below the figure at which it stood prior to the crisis. The Company's 3 p.ct. and 5 p.ct. debentures also strengthened, as did the South Metropolitan Company's 3 p.ct. and South Suburban 5 p.ct. debenture. Ordinary issues in the main continue without change, though a sharp fall of 2s. 6d. occurred last week in Colonial £1 shares to 10s., while European lost 2 points to 105.

It is apparent that in the case of some of the more popular preference and debenture issues any stock coming into the market at the present time is for the most part in respect of forced sales, and some good bargains have been obtained. It will be seen from the Stock and Share List that transactions in several 5 p.ct. debenture stocks were recorded at prices considerably below par, while the South Metropolitan 6 p.ct. preference, which seven weeks ago was dealt in at 116, changed hands at 103⅝. Another case in point is that of the Mid-Southern District Utility 4 p.ct. preference in which business was done at 67.

Current Sales of Gas Products.

The London Market for Tar and Tar Products.

LONDON, *Nov.* 2.

Tar products continue steady; current values are as under:

Pitch, from 60s. to 65s. per ton f.o.b.

Creosote, for export, from 3⅝d. to 5d. per gallon f.o.b., according to specification.

Pure toluole is firm at about 2s. 3d. per gallon; benzole is about 1s. 5d. per gallon; 95/160 solvent naphtha, about 1s. 5d. to 1s. 6d. per gallon; pyridine bases, 3s. 3d. to 3s. 6d. per gallon.

Tar Products in the Provinces.

Nov. 2.

The average prices of gas-works products during the week were: Gas-works tar, 22s. to 26s. Pitch—East Coast, 55s. to 56s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 55s. to 56s. f.o.b.* Toluole, naked, North, 1s. 8d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 11½d. Creosote, *ex* works, in bulk, North, liquid and salty, 3½d. to 3⅝d.; low gravity, 1½d.; Scotland, 3½d. to 3⅝d. Heavy oils, in bulk, North, 5d. to 5½d. Carbolic acid, 60's, 1s. 6½d. to 1s. 7d. Naphthalene, £9 to £10. Salts, 50s. to 70s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Oct.* 31.

A fair volume of business has been placed during the week, but the forward position continues so uncertain that distillers are unwilling to quote for more than moderate quantities. Stocks of most products remain low in this area.

Pitch.—Business is confined to small quantities. Export value is now 55s. to 57s. 6d. per ton f.o.b. Glasgow, while truck loads command 55s. per ton *ex* works.

Refined tar to Ministry of Transport Specification is being accumulated at makers' works and price for spot lots is 3½d. to 3⅝d. per gallon f.o.r. in buyers' packages.

Creosote oil.—Orders are quite numerous, but values are unchanged. B.E.S.A. Specification is 2⅞d. to 3d. per gallon; low gravity, 3¼d. to 3⅜d. per gallon; and neutral oil, 3¼d. to 3⅜d. per gallon—all f.o.r. in bulk.

Cresylic acid.—No change has yet become apparent and quotations are irregular. Pale, 97/99 p.ct., 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale, 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon—all f.o.r. works.

Crude naphtha.—Value remains steady at 4½d. to 5d. per gallon, according to quality.

Solvent naphtha.—Orders are scarce with prices unchanged; 90/160 being 1s. 3d. to 1s. 4d. per gallon, and 90/190, 1s. to 1s. 1d. per gallon.

Motor benzole.—While makers' prices are steady at 1s. 3d. to 1s. 4d. per gallon f.o.r. in buyers' rail cars, very few orders are being placed.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	7	to	0	7¼	per gallon at works
Motor "	1	2	"	1	3	" " "
Pure "	1	6	"	1	7	" " "

Contracts Advertised To-Day.

Boiler House and Mess Room and Laboratory.

The Oldham Corporation invite tenders in connection with the above. [Advert. on p. 324.]

Firebricks, &c.

The Gas Department of the City of Salford invite tenders for the supply of firebricks, tiles, &c. [Advert. on p. 324.]

Metropolitan Gas Companies' Testings.

The Gas Referees' report on the official testings for the past quarter gives the following average calorific values for the gas supplied by the Metropolitan Companies named.

Commercial Gas Company.—502·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Gas Light and Coke Company.—502·9 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—561·2 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—563·2 B.Th.U. (declared calorific value, 560 B.Th.U.).

Tottenham and District Gas Company.—501·5 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—472·1 B.Th.U. (declared calorific value, 470 B.Th.U.).

Market Harborough Gas-Works.

The total expenditure on capital account has been £1150, of which £800 was on account of the new dry neutral sulphate of ammonia plant, £145 for water softening plant, £137 for meters, &c., and £68 for new mains and services. Last year the expenditure was £844. The expenditure on revenue account was £17,894, and the income £24,005, leaving a gross profit of £6111. The amount required to meet the interest on and repayment of loans was £4570, income-tax £893, and revenue expenditure in additions to plant £350; a total of £5814. This leaves a net profit of £297, by which sum the credit balance of the account is increased, and now stands at £6999. During the year 5685 tons of coal were carbonized, which tonnage is greater than last year by 116 tons. The total make of gas was 106,461,700 c.ft., a decrease of 3,095,000 c.ft., and is due to the loss of a portion of the industrial load and to electrical competition.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Oct. 31. (Provincial Exchanges Oct. 30.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Oct. 5	7½	7½	Alliance & Dublin Ord. ...	100—105	...	102—102½
374,000	,,	July 9	4	4	Do. 4 p.c. Deb. ...	67—72	...	...
522,655	,,	Aug. 24	7	7	Barnet Ord. 7 p.c.	121—126	...	125
300,000	1	Oct. 19	1/9⅔	1/4⅓	Bombay, Ltd.	15/—17/6	...	17/-
174,500	10	Aug. 10	9	9	Bournemouth 5 p.c. ...	14½—15½	...	...
600,050	10	,,	7	7	Do. B 7 p.c. ...	12—13	...	12½
439,160	10	,,	6	6	Do. Pref. 6 p.c. ...	10½—11½	...	...
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb. ...	55—60	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	75—80	...	...
357,900	,,	Aug. 24	7½	7½	Brighton & Hove 6 p.c. Con.	114—119	...	115—115½
371,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	104—107	...	105—105½
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	90—93[a]	...	...
120,420	,,	June 25	4	4	Do. 1st 4 p.c. Deb. ...	78—80[a]	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	73—80[a]	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	93½—99½[a]	...	...
855,000	,,	Oct. 5	8	7	British Ord.	108—113	...	110—111
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	70—75	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	92—97	...	...
160,000	,,	June 25	5	5	Cambridge 5 p.c. Deb. ...	95—100	...	...
100,000	10	May 21	6	8	Cape Town, Ltd.	9—10	...	...
100,000	10	Oct. 30	4½	4½	Do. 4½ p.c. Pref. ...	6⅞—7½*	—½	...
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb. ...	65—70	...	...
626,860	,,	July 23	6	6	Cardiff Con. Ord.	95—98	...	...
237,860	,,	June 25	—	2½	Do. 5 p.c. Red. Deb.	90—95	...	...
157,150	,,	Aug. 10	5½	5	Chester 5 p.c. Ord.	85—90[b]	...	...
98,936	1	Oct. 5	1/2/-	2/-	Colombo, Ltd. Ord.... ...	27/—32/-	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	17/—19/-	...	...
609,204	1	Oct. 19	1/3'27	-/10'90	Colonial Gas Assn. Ltd. Ord.	7/6—12/6	—2/6	7/6—8/6
296,053	1	,,	1/5'67	1/2'54	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,380	Stk.	July 23	6	6	Commercial Ord.	92—96	...	...
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. ...	59—67	...	...
787,560	,,	Aug. 10	7	7	Croydon sliding scale ...	107—110	...	107½—108½
458,100	,,	,,	5	5	Do. max. div.	81—84	...	...
842,370	,,	Aug. 24	10	7	Derby Con.	120—125[c]	...	...
65,000	,,	June 25	4	4	Do. Deb.	65—70[c]	...	...
909,000	,,	Sept. 7	5	5	East Hull Ord. 5 p.c. ...	70—73	...	...
1,002,180	,,	Sept. 21	†6½	†4	European, Ltd.	100—110	—2	102—109
18,953,033	,,	July 23	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	18/6—19/6[f]	...	19/1½—19/6
2,800,000	,,	,,	3½	3½	Do. 3½ p.c. max.	55—60	...	59
4,294,691	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	74—79	+½	74—78½
5,694,995	,,	June 11	3	3	Do. 3 p.c. Con. Deb. ...	56—61	+2	59—61
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	98—102	+1½	100½—100⅞
2,500,000	,,	,,	—	4½	Do. 4½ p.c. Red. Deb. ...	89—94	...	91½—92½
161,480	,,	Sept. 7	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
89,500	,,	Aug. 24	7	7	Hastings & St. L. 5 p.c. Conv.	95—100	...	97½—99½
268,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	80—85	...	83½
70,000	10	9 Oct. '30	½	10	Hongkong & China, Ltd. ...	12½—13½	...	...
213,200	Stk.	Aug. 10	6	6	Hornsey Con. 3½ p.c. ...	89—92	...	...
2,800,000	,,	Oct. 30	25	15	Imperial Continental Cap.	345—365*	...	347—368
223,180	,,	Aug. 10	3½	3½	Do. 3½ p.c. Red. Deb.	70—75	...	...
225,242	,,	Aug. 10	3½	3½	Lea Bridge 5 p.c. Ord. ...	129—132	...	...
2,145,907	,,	Aug. 24	6	6	Liverpool 5 p.c. Ord. ...	94—95[b]	+1	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	79—81[b]	...	...
165,786	,,	Aug. 24	9	8	Maidstone 5 p.c. Cap. ...	123—128	...	...
63,480	,,	June 25	3	3	Do. 3 p.c. Deb. ...	55—60	...	...
75,000	5	June 11	†10	†10	Malta & Mediterranean ...	6⅞—7½	...	...
393,000	—	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb. ...	78—83	...	...
171,978	Stk.	Aug. 24	5	5	M. S. D. Utility "C," Cons.	76—81	...	...
522,992	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	67—72	...	67
675,000	,,	May 21	†6	†6	Montevideo, Ltd.	70—80	...	...
2,061,815	,,	Aug. 10	5⅔	5	Newcastle & Gateshead Con.	15/3—16/3[d]/	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	69—71[d]	—1½	...
691,705	,,	June 25	3½	3½	Do. 3½ p.c. Deb. ...	69—71[d]	...	...
277,285	,,	May 7	5	5	Do. 5 p.c. Red. Deb.	98—100[d]	...	...
199,940	,,	Aug. 24	7½	7½	North Middlesex 6 p.c. Con.	105—110	...	...
396,160	,,	Aug. 10	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	,,	Apl. 23	9	7	Oriental, Ltd.	93—103	...	...
69,000	5	13 May, '15	—	—	Ottoman	0—½	...	...
205,162	Stk.	June 25	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	,,	Aug. 24	8	8	Portsm'th Con. Stk. 4 p.c. Std.	119—124	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	76—79	...	...
686,312	,,	July 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	83—86	...	84½
889,813	,,	June 25	4	4	Do. 4 p.c. Cons. Deb.	84—87	...	86
150,000	10	Sept. 21	6	6	San Paulo 6 p.c. Pref. ...	7½—8	...	...
1,736,968	Stk.	Sept. 7	6½	6	Sheffield Cons.	103—105[e]	...	...
95,000	,,	July 9	4	4	Do. 4 p.c. Deb.	79—81[e]	...	...
133,201	,,	Sept. 7	5	5½	Shrewsbury 5 p.c. Ord. ...	72—77	...	...
90,000	10	June 11	15	15	South African	5½—5¾	...	...
6,709,395	Stk.	July 23	7½	5	South Met. Ord.	99—102	+1	100½—102
1,185,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	100—105	...	103½—104
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb. ...	56—61	+2	57½
1,000,000	,,	July 23	4	5	Do. 5 p.c. Red. Deb.	95—100	—½	95—99
91,500	,,	Aug. 10	8½	8½	South Shields Con.	108—110[d]	...	...
1,543,795	,,	Aug. 10	6½	6½	South Suburban Ord. 5 p.c.	101—104	...	...
668,887	,,	June 25	5	5	Do. 5 p.c. Deb.	92—97	+2	...
647,740	,,	Aug. 24	5	5	Southampt'n Ord. 5 p.c. max.	76—79	...	...
121,275	,,	June 25	4	4	Do. 4 p.c. Deb.	70—75	...	...
250,000	,,	Aug. 24	7	7	Swansea 7 p.c. Red. Pref. ...	95—98[b]	...	...
200,000	,,	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	...	...
1,076,490	,,	Aug. 10	6⅔	6⅔	Tottenham and District Ord.	103—107	+1	105—106
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	93—98	...	...
199,005	,,	June 11	4	4	Do. 4 p.c. Deb. ...	70—75	...	...
85,701	,,	Sept. 21	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	72—77	...	...
310,694	,,	Aug. 24	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	100—105	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	88—93	...	...
1,322,290	,,	July 9	7	7	Wandsworth and District: Consolidated	111—114	...	...
971,373	,,	,,	5	5	Do. 5 p.c. Pref.	90—95	+½	92—95
1,167,964	,,	June 25	5	5	Do. 5 p.c. Deb.	93—98	+1	94½—98

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Div. = 16 p.c. p.s. less tax and less tax on interim dividend.

(This announcement is inserted gratuitously.)

PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,
SCHOOL FOR THE BLIND
(Founded 1838).
Swiss Cottage, LONDON, N.W.3

The Subscription List will be opened on the 9th day of November, 1931, and will be closed on or before 12 noon on the 16th day of November, 1931.

THE DUDLEY, BRIERLEY HILL AND DISTRICT GAS COMPANY.

Directors:

W. W. SKIDMORE WESTWOOD, Esq., "West Hill," Stourbridge (*Chairman*).
WILLIAM H. THOMPSON, Esq., "Lutley House," St. James's Road, Dudley (*Deputy Chairman*).
E. C. THEEDAM, Esq., J.P., "Elmhurst," Pedmore, Stourbridge.
A. E. MARSH, Esq., J.P., Duneley Hall, Near Stourbridge.
F. P. FELLOWS, Esq., J.P., C.A., "Heathdene," Stourbridge.
J. T. HIGGS, Esq., "The Poplars," Pensnett, Near Dudley.
W. H. BORASTON, Esq., "Sefton Cottage," Welford-on-Avon, Stratford-on-Avon.
FRAS. C. BRIGGS, Esq., M.Inst.Gas E., Assoc.M.Inst.C.E., A.M.I.Mech.E., A.M.I.Chem.E., M.I.Struct.E., "Trebant," St. James's Road, Dudley (*Managing Director*).

Solicitors:

MESSRS. SLATER & CAMM, 198, Wolverhampton Street, Dudley.

Auditors:

THOMAS H. GOUGH, Chartered Accountant, 267/8, Castle Street, Dudley
H. HARMSHAW, Incorporated Accountant, 267/8, Castle Street, Dudley.

Bankers:

MESSRS. BARCLAYS BANK LIMITED, High Street, Dudley.

Engineer:

FRAS. C. BRIGGS, Chartered Gas Engineer, Chartered Civil Engineer, Chartered Mechanical Engineer.

Secretary:

GEO. E. ASHURST, F.C.I.S., Chartered Secretary, Messrs. The Dudley, Brierley Hill & District Gas Co., Spring Gardens, Dudley.

ISSUE OF £45,000 5 per cent. REDEEMABLE DEBENTURE STOCK

under powers conferred by the Dudley Gas Acts and Orders 1853 to 1931 and ranking as to Principal after the existing Loan Capital set out below but *pari passu* as to interest (see Clause 39 Dudley, Brierley Hill and District Gas Order 1931 printed below).

ISSUE PRICE—PAR.

PAYABLE AS FOLLOWS:

10% on application.
90% on allotment.

Redeemable at par on or after the 1st day of September, 1946, upon six months notice from the Company or upon the 1st day of September, 1956, if not previously redeemed.

Interest will be payable half-yearly on the 1st March and the 1st September, the first payment being made on 1st March, 1932, and calculated from the first day of December, 1931.

No portion of this issue has been under-written.

The Stock will be registered in the Company's Books and the Certificates issued in the names of the applicants or their nominees free of expense. It will be transferable by Deed in sums of One Pound or an integral number of Pounds.

The Subscription List will be opened on the 9th day of November, 1931, and will be closed on or before 12 noon on the 16th day of November, 1931.

Should the issue be over-subscribed, the Stock will be allotted *pro rata* to the applications received. In the case of partial allotment, the balance of the deposit will be applied towards payment of the remainder of the purchase money. If no allotment is made, the deposit will be returned in full.

Further copies of this Prospectus and Application Forms may be obtained from the Secretary or Bankers of the Company.

Cheques should be made payable to the Company or Bearer, crossed "Messrs. Barclays Bank Limited." If a remittance is sent by post in any form other than by cheque the envelope should be registered.

The Town of Dudley Gas Light Company was first Incorporated by Act of Parliament in 1820 and re-incorporated by Act of Parliament in 1853.

The Brierley Hill District Gas Light Company was first Incorporated by Act of Parliament in 1849 and re-incorporated by Act of Parliament in 1865.

The two Companies were by special order of the Board of Trade amalgamated and formed into the Dudley, Brierley Hill & District Gas Company on the 1st October, 1931, and the undertaking is now governed by the Dudley Gas Acts and Orders, 1853 to 1931.

BOTH COMPANIES HAVE PAID THEIR MAXIMUM STATUTORY DIVIDENDS FOR OVER FIFTY YEARS.

The Net Revenue of the two Companies together for the year ended 31st December, 1930, after charging all expenditure, including Bank Interest and Directors' Fees but before charging Income Tax Schedule D and Mortgage and Debenture Stock Interest, amounted to £14,975 4s. 3d., and the Net Revenue for the present year shows a substantial increase.

The Interest on the existing Loan (Mortgage and Debenture) Capital and that now to be issued will amount to £5506 10s. 0d. per annum.

It will therefore be seen that the Net Revenue of the Company is sufficient to cover the Mortgage and Debenture Interest, including the new issue, nearly three times.

Authorised Capital £330,685 0 0

Issued Capital

	£	s.	d.
5 per cent. Consolidated Ordinary Stock...	208,660	0	0
5 per cent. Consolidated Preference Stock	15,275	0	0
	£223,935	0	0

Authorised Loan Capital ... £176,017 10 0

Issued Loan Capital

	£	s.	d.
Mortgages 4½ per cent.	3,000	0	0
Mortgages 5 per cent.	19,000	0	0
4 per cent. Debenture Stock	2,500	0	0
4½ per cent. Debenture Stock	9,500	0	0
5 per cent. Redeemable Debenture Stock (Redeemable 1st September, 1941)	32,880	0	0
	£66,880	0	0

The area of supply comprises the Borough of Dudley, a small part of the Urban District of Sedgley, the Urban Areas of Brierley Hill and Quarry Bank, and the Parishes of Kingswinford (except a portion of the District of Wordsley), Wombourn, Himley and Kinver, covering some 35 square miles with an estimated Population of 100,000.

Many of these areas are rapidly developing, and the Company anticipates considerably increased Revenue in the future.

The Output of Gas for 1930 was over 497 million cubic feet (over 2½ million therms), and the number of consumers nearly 20,000.

During the last eight years there has been a constant increase of output of Gas every year, and the demand is still increasing.

Not only are the uses of Gas for Domestic purposes increasing, but there are constantly being found increasing outlets for Gas in Manufacturing processes, and a considerable percentage of the Company's Sales are for that purpose.

The Capital now being issued is for the purpose of extensions of works plant, district mains, &c., rendered essential to deal with the increase in the Company's business.

Application will be made in due course to the Committee of the Birmingham Stock Exchange for permission to deal and for an official quotation for this Stock.

By Order of the Directors,
G. E. ASHURST,
Secretary.

GAS WORKS,
DUDLEY, WORCS.
2nd November, 1931.

DUDLEY, BRIERLEY HILL & DISTRICT GAS ORDER, 1931.

CLAUSE 39.

The Company may create and issue debenture stock subject to the provisions of Part III. of the Companies Clauses Act, 1863, as amended in its application to the Company, but notwithstanding anything therein contained the interest of all debenture stock and all mortgages at any time created and issued or granted by the Company under any previous Act or Order or this Order or any subsequent Act or Order shall subject to the provisions of any subsequent Act or Order rank *pari passu* (without respect to the dates of the securities or of the Act or Order or resolutions by which the stock and mortgages were authorized) and shall have priority over all principal moneys secured by such mortgages. Notice of the effect of this provision shall be endorsed on all mortgages and certificates of debenture stock issued after the date of this Order.

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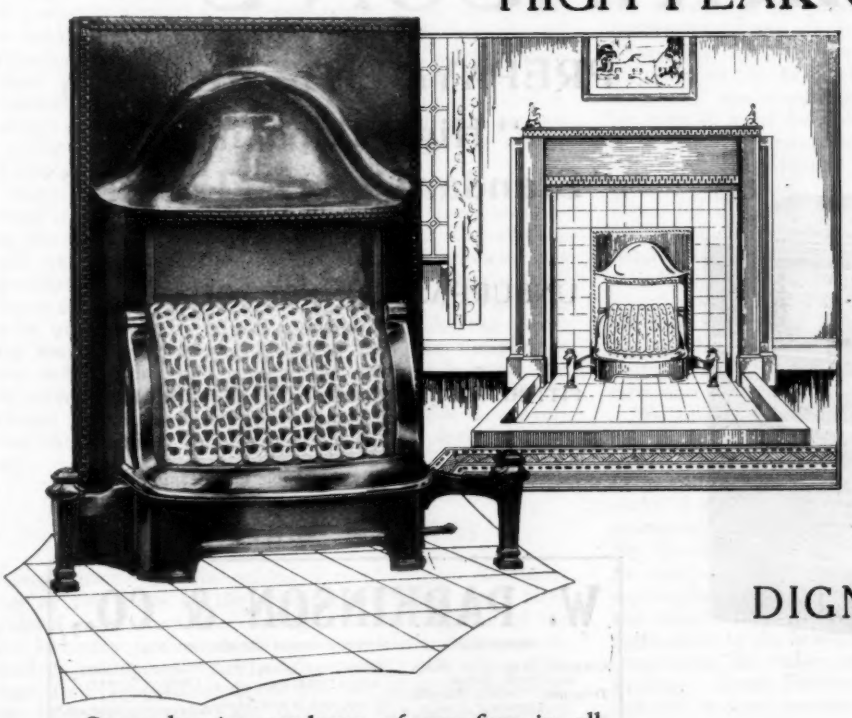
GENERAL

MAGNA SERIES OF HIGH PEAK GAS FIRES



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Advertisement of General Gas Appliances, Ltd., Guide Bridge, Manchester

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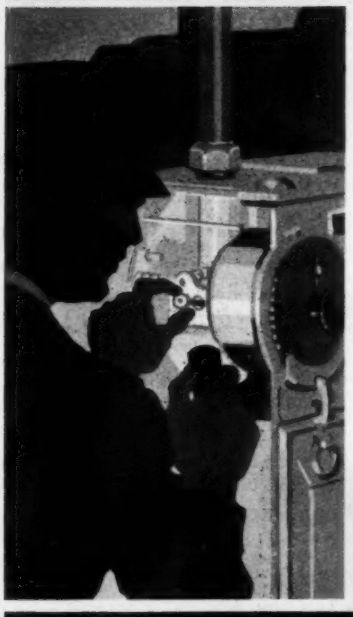

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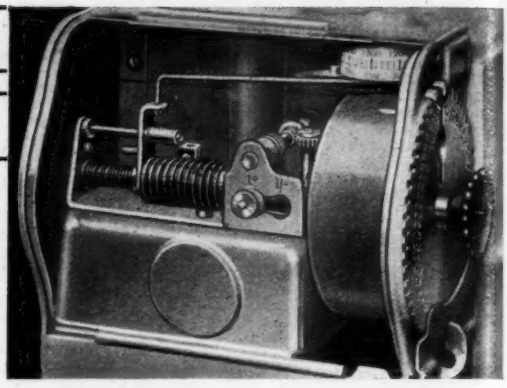

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